

# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.  
Published by the MacLean Publishing Company, Limited, Toronto, Canada

Vol. XXII. No. 18

Publication Office: Toronto, October 30, 1919

Subscription Price  
\$3.00 per year.

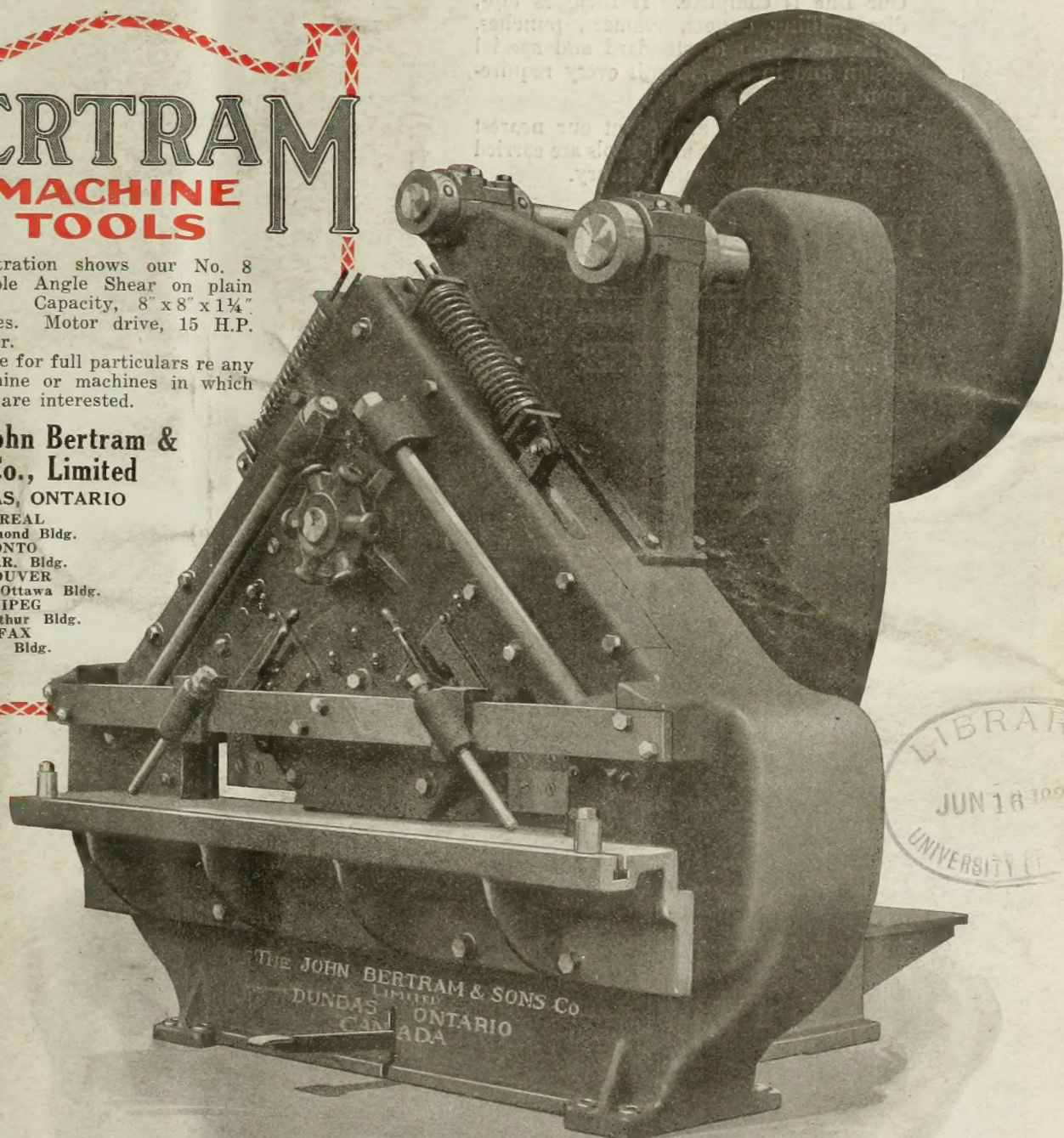
### BERTRAM MACHINE TOOLS

Illustration shows our No. 8 Double Angle Shear on plain base. Capacity, 8" x 8" x 1 1/4" angles. Motor drive, 15 H.P. motor.

Write for full particulars re any machine or machines in which you are interested.

**The John Bertram & Sons Co., Limited**  
DUNDAS, ONTARIO

MONTREAL  
723 Drummond Bldg.  
TORONTO  
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VANCOUVER  
609 Bank of Ottawa Bldg.  
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1205 McArthur Bldg.  
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THE JOHN BERTRAM & SONS CO  
LIMITED  
DUNDAS, ONTARIO  
CANADA

P13201



**All the Fine Qualities  
That Good Work Demands**

Pratt & Whitney Small Tools enjoy an enviable reputation for excellence that has been well earned in the high production shops of the country. Where stamina as well as exceptional accuracy and precision are required P & W Tools have more than held their own.

Our line is complete. It includes taps, dies, milling cutters, reamers, punches, drills, etc., both of standard and special design and in sizes to suit every requirement.

Prompt service is assured at our nearest store, where P & W Small Tools are carried in stock for immediate delivery.

**PRATT & WHITNEY CO.  
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Works: Dundas, Ontario

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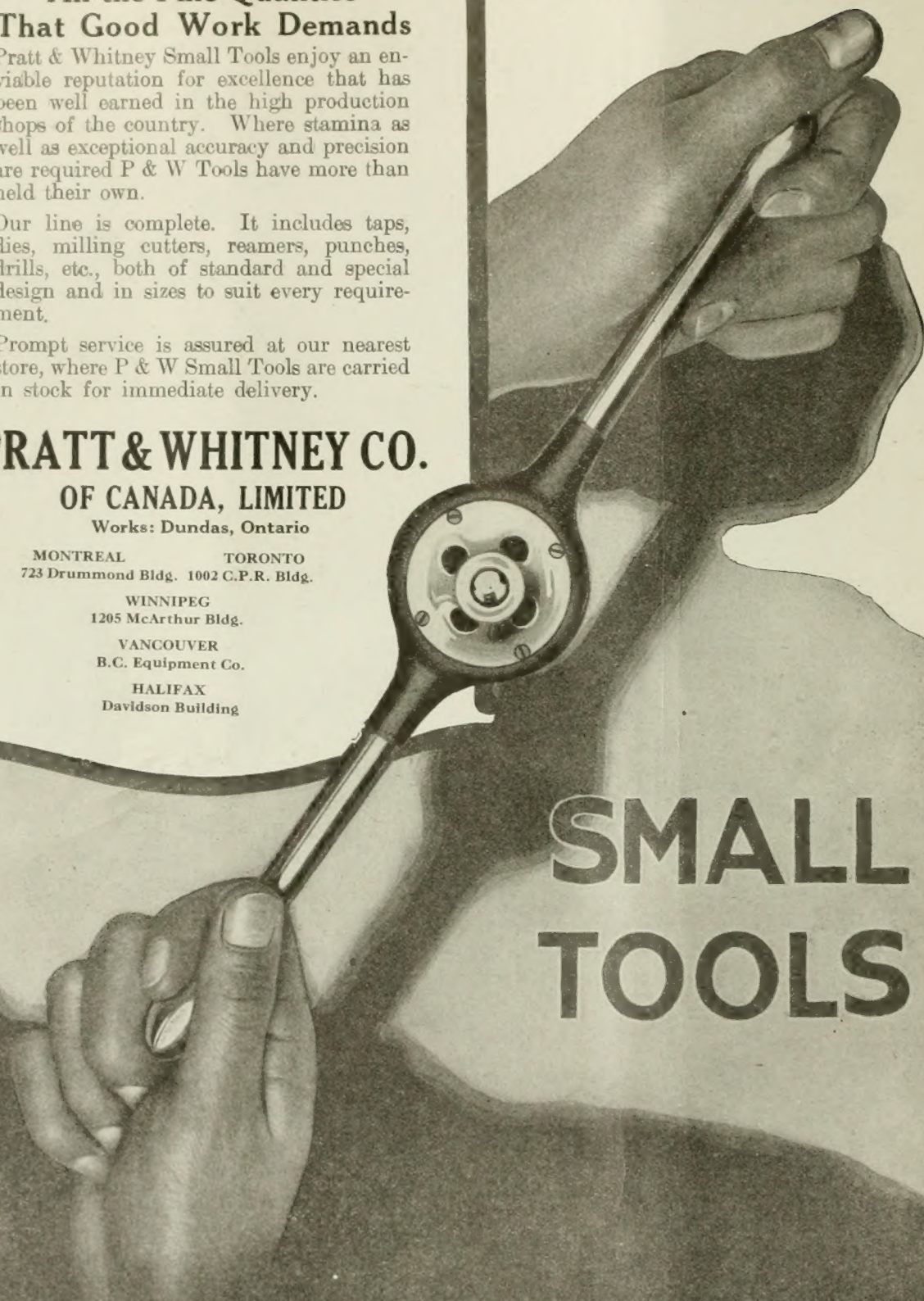
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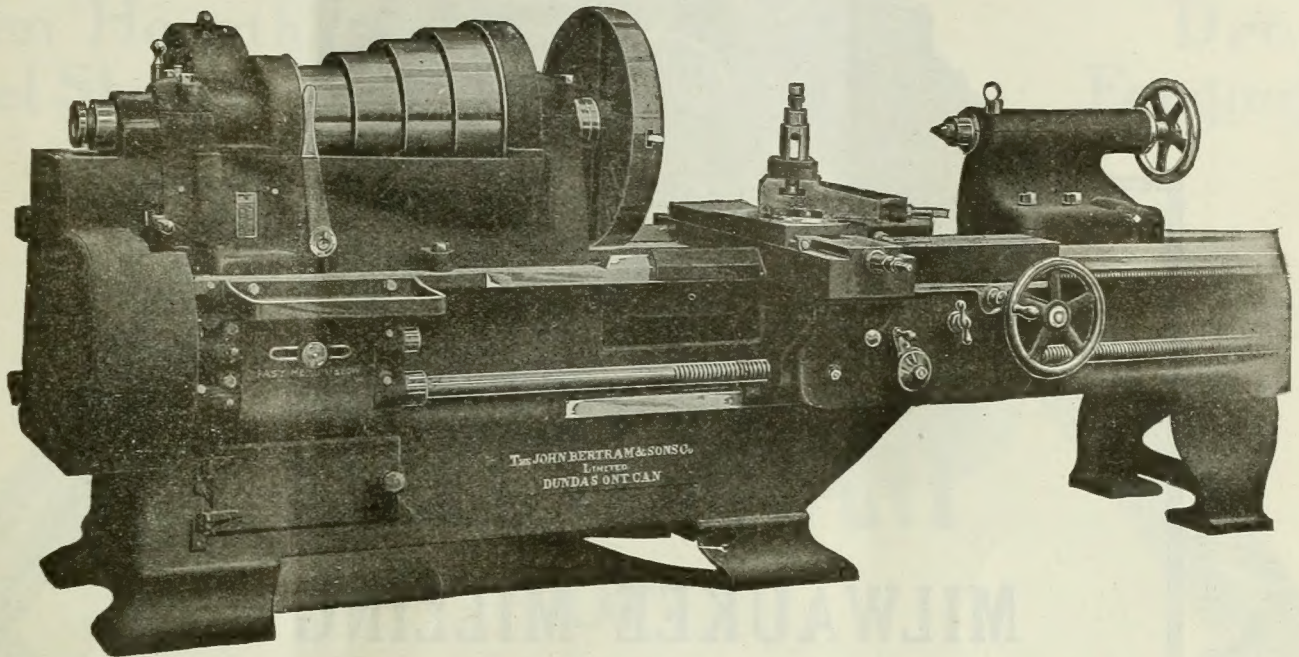
**SMALL  
TOOLS**

**PRATT & WHITNEY**





# BERTRAM MACHINE TOOLS



## Double Back Geared Gap Lathe

26-inch x 42-inch Swing

Bertram Machine Tools are built for safety and service, and are backed by a concern with sixty years' experience and the largest of its kind in Canada.

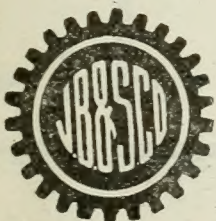
## The John Bertram & Sons Co., Limited

*Miscellaneous Department*

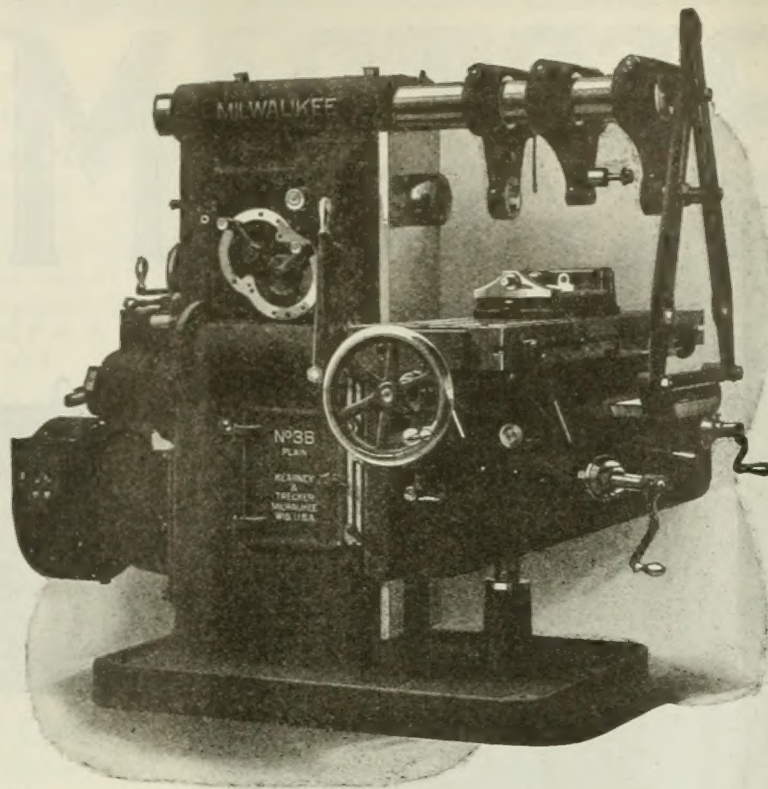
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## MILWAUKEE MILLING MACHINES

### Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

### Other Distinctive Milwaukee Features:

Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication—one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

*Send for our No. 21 Catalogue. Illustrating and describing  
Milwaukee Milling Machines and accessories in detail*

**KEARNEY & TRECKER CO.**  
MILWAUKEE, WIS. U.S.A.



By Product Coke

Hamilton Pig Iron

Open Hearth  
Steel Billets

Steel and  
Iron Bars

Open Hearth  
Steel Sheets

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Forgings

**Quality**

THE  
**STEEL COMPANY**  
OF  
**CANADA**  
LIMITED

HAMILTON MONTREAL

**Service**

Railway  
Fastenings

Wrought  
Pipe

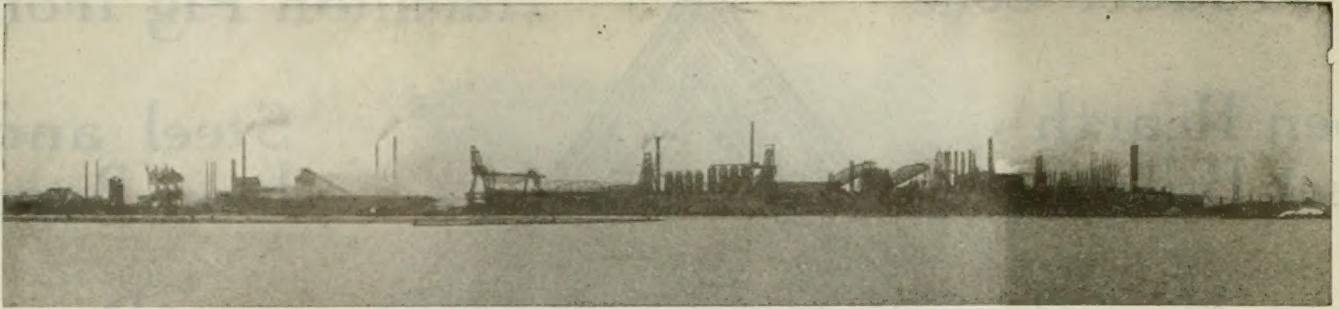
Pole Line  
Hardware

Screws & Nails

Bolts Nuts & Washers

Wire & Wire Products





General View of the Plant of the Algoma Steel Corporation from the Waterfront.

# ANNOUNCEMENT



**T**HE ALGOMA STEEL CORPORATION, LIMITED, take pleasure in announcing to their customers and the Canadian trade that in accordance with the widespread desire throughout the Dominion that there should be obtained in Canada with Canadian labor, a much larger proportion of the requirements of this country in STEEL SECTIONS for STRUCTURAL PURPOSES, CAR CONSTRUCTION, SHIPBUILDERS' REQUIREMENTS, etc., they are just completing extensive alterations and additions to their rolling mills, and on or about 1ST NOVEMBER, will be ready to produce and ship American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1 1/4" x 1 1/4", ZEE BARS for car builders and general purposes, small and large ROUNDS and SQUARES, and FLAT BARS up to 14" wide. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process, and can be furnished in all grades from the softest rivet stock to high carbon special spring material.

## The following are the sections which will be rolled:---

### ANGLES—Equal Leg—

6 x 6"—5 x 5"—4 x 4"  
 3 1/2 x 3 1/2"—3 x 3"  
 2 1/2 x 2 1/2"—2 1/4 x 2 1/4"  
 2 x 2"—1 3/4 x 1 3/4"  
 1 1/2 x 1 1/2"—1 1/4 x 1 1/4"

### ANGLES—Unequal Leg—

6 x 4"—6 x 3 1/2"—5 x 4"  
 5 x 3 1/2"—5 x 3"—4 1/2 x 3"  
 4 x 3 1/2"—4 x 3"—3 1/2 x 3"  
 3 1/2 x 2 1/2"—3 x 2 1/2"—3 x 2"  
 2 1/2 x 2"

### BEAMS—

15", 12", 10", 8", 6", 5", 4", 3".

### CHANNELS—

15", 13", 12", 10", 8", 6", 5", 4", 3".

### ZEEES—

3 1/4 x 5 x 3 1/4 x 5/16  
 3 5/16 x 5 1/16 x 3 5/16 x 3/8"  
 3 3/8 x 5 1/8 x 3 3/8 x 7/16"  
 3 1/16 x 4 x 3 1/16 x 1/4"

3 1/8 x 4 1/16 x 3 1/8 x 5/16"

3 3/16 x 4 1/8 x 3 3/16 x 3/8"

2 11/16 x 3 x 2 11/16 x 1/4"

2 3/4 x 3 1/16 x 2 3/4 x 5/16"

### ROUNDS—

All sizes from 1/2" up to and including 4".

### SQUARES—

All sizes from 1/2" up to and including 3".

### FLATS—

All sizes from 1 x 1/4" up to and including 14" wide.

### MINE RAILS—

All sections from 12 lbs. up to and including 45 lbs. per yard.

### PIG IRON—

Machine cast FOUNDRY MALLEABLE and BASIC.

### SULPHATE OF AMMONIA.

### NITRE CAKE.

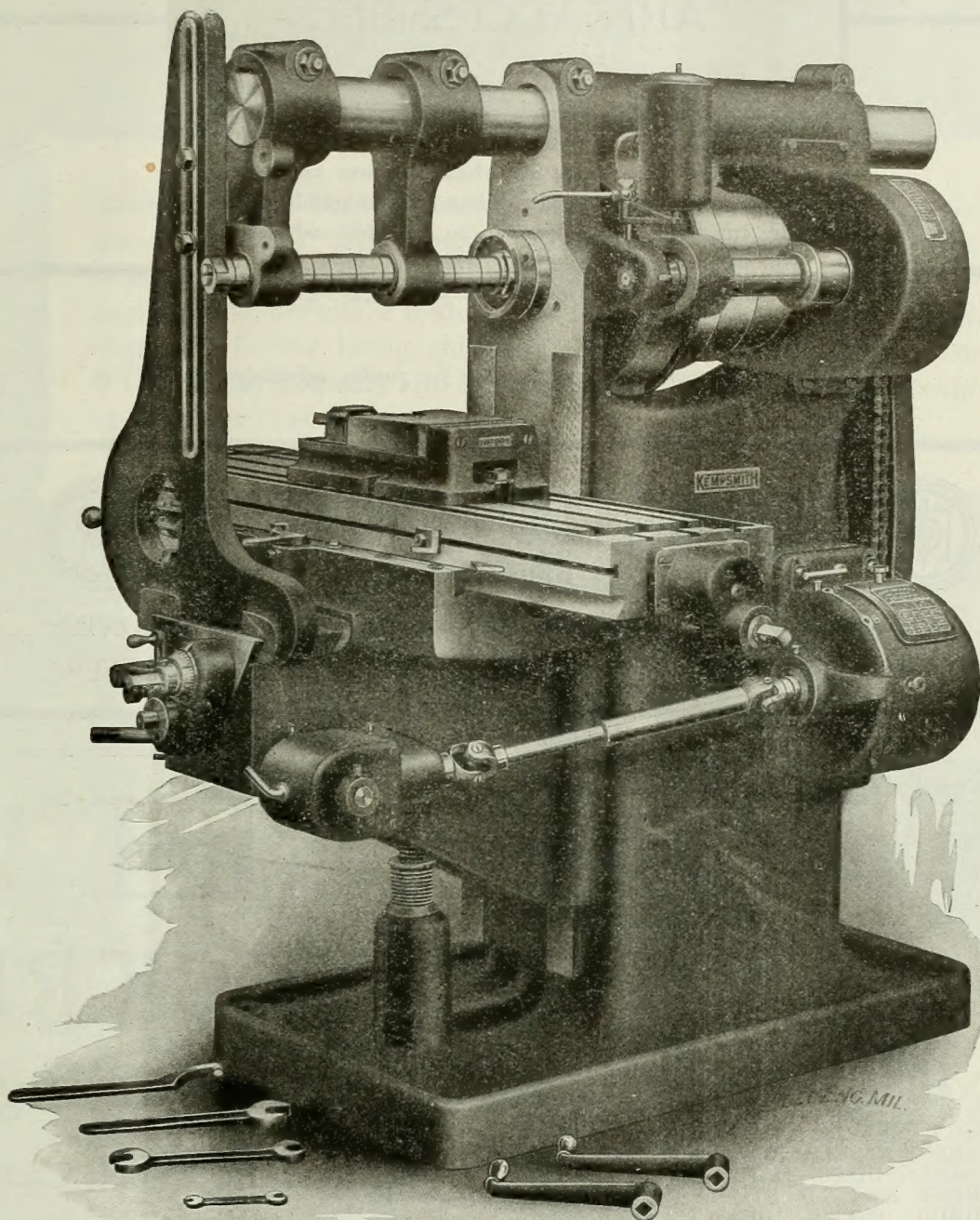
For the better convenience of customers who may find it necessary to secure rush shipments of particular items, they contemplate keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared. Your enquiries and business will be appreciated.

## ALGOMA STEEL CORPORATION

SAULT STE. MARIE, ONTARIO



# KEMPSMITH



## KEMPSMITH No. 3 Plain Milling Machine

Double Back Geared.

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kemp Smith Miller. Write for a copy to-day.

## THE KEMPSMITH MANUFACTURING CO.

MILWAUKEE, WIS., U.S.A.

FOREIGN REPRESENTATIVES:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada. Barandiaran & Co., 3 Alameda, San Sebastian, Spain. Bevan & Edwards, Pty., Ltd., 117-29 King St., Melbourne, Australia. Edgar Bloxham, 12 Rue du Delta, Paris, France. D. Drury & Co., 1-2 Central House, Main St., Johannesburg, South Africa. Roku-Roku-Shoten, 3 Shinsakanacho, Kyobashiko, Tokyo, Japan. Nielsen & Winthers, Blegdamsvej, 60, Copenhagen, Denmark. Parke & Lacy Co., Ltd., 60 Clarence St., Sydney, N.S.W., Australia. Selson Engr. Co., 19 Via Botero, Turin, Italy, and 85 Queen Victoria St., London, E.C., England. Spliethoff, Beeuwkes & Co., Leuvehaven, W.Z., 159, Rotterdam, Holland.

*If interested tear out this page and place with letters to be answered.*



## OUR AIR COMPRESSORS ARE ACCESSIBLE

One of the most important points about an air compressor is that it should be so built that inspection and cleaning can be done with the least amount of trouble. The horizontal type of construction which we have adopted is particularly handy—cylinder, valves, etc., are readily accessible; crossheads and guides can be inspected and cleaned without unscrewing bolts and removing plates; and the crank, etc., are available for inspection simply by lifting off a cover.

*Write for our compressor bulletins for further information.*



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**Canadian Ingersoll-Rand Company  
Limited**

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**Swedish Steel & Importing  
Co., Limited**

Montreal  
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Direct representa-  
tives of foremost  
Swedish mills;  
makers of

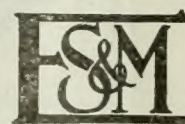
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### Tool Steels

ALLOY STEELS, BILLETS,  
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HIGH SPEED STEELS,  
DRILL RODS, DRAWN  
BARS, SEAMLESS TUB-  
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AND IRON ENDS, HOL-  
LOW AND SOLID MINING  
DRILL STEEL.



PROMPT SHIPMENTS  
from large stock



## ELECTRIC Steel Castings

High Grade STEEL Castings  
Of Every Description

**Prompt Deliveries**

Send us your drawings  
for estimates.

**THE ELECTRIC STEEL AND METALS  
COMPANY, LIMITED**

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# WILT

Machine shop foremen and superintendents who invariably specify "WILT" when requisitioning tools know **WILT Drills, Reamers and Milling Cutters** are superior—are absolutely guaranteed against defective material and workmanship — are rigidly inspected before being shipped. To increase production, use **WILT Drills, Reamers and Milling Cutters**. Elimination of breakage alone will save you much.

## HIGH SPEED AND CARBON TWIST DRILLS

### WILT TWIST DRILL CO. OF CANADA, LIMITED

Walkerville.

Ontario.

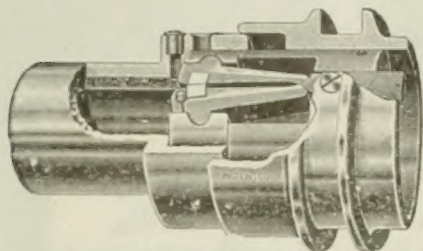
London Office: Wilt Twist Drill Agency, Moorgate Hall,  
Finsbury Pavement, London, E.C.2, Eng.

*"Where there's a WILT  
—there's the way."*

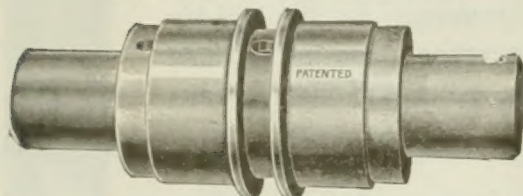


# THE JOHNSON FRICTION CLUTCH

## The Clutch for Your Machine Made to Order



Single Clutch—Interior—Clutch Disengaged.



Double Clutch.

Where space is limited and conditions are exacting, the clutch problem presents difficulties—unless you know about Johnson clutches. We offer you an efficient clutch made in any size or form that your machine requires. When you are designing a new machine, it will be worth while to consult us. Our facilities are at your disposal without any obligation to you.

### THE JOHNSON FRICTION CLUTCH

THE CLUTCH OF A THOUSAND USES

WRITE TO-DAY FOR OUR YELLOW DATA SHEETS

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THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Coal  
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Victoria

FOUNDRY & MALLEABLE

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Sales Agents:  
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Canadian Office:  
904 C.P.R. Bldg., Toronto

# FIRTH'S

Speedicut <sup>HIGH</sup>SPEED Steel  
Insures Maximum Production

FIRTH'S CARBON TOOL STEELS  
Standard Brands Highest Quality

THOS. FIRTH & SONS, Limited, Sheffield, England

CANADIAN WAREHOUSES | 449 St. Paul St. West, MONTREAL  
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J. A. SHERWOOD  
Canadian Manager



*It is the duty of all to*

# BUY VICTORY BONDS

*and, by supporting the present Loan, to maintain Canada's credit  
and secure her future prosperity.*

---

Canadian Steel Foundries, Limited  
Montreal

SMELTERS

METALS

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## COPPER AND BRASS INGOTS

Made in Standard Mixtures or According to Specifications



Our guaranteed analysis Brass Ingot Metal will save you money in your metal purchases, also you have the positive assurance of exactness and accuracy of quality, and in casting the elimination of melting losses and defective castings.

"EVERY METAL THE BRASS FOUNDER NEEDS"

THE CANADA METAL CO., LIMITED

HAMILTON

MONTREAL

TORONTO

WINNIPEG

VANCOUVER

THE



**FOUNDRY**  
GALT - ONT.

## Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

### If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns. We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

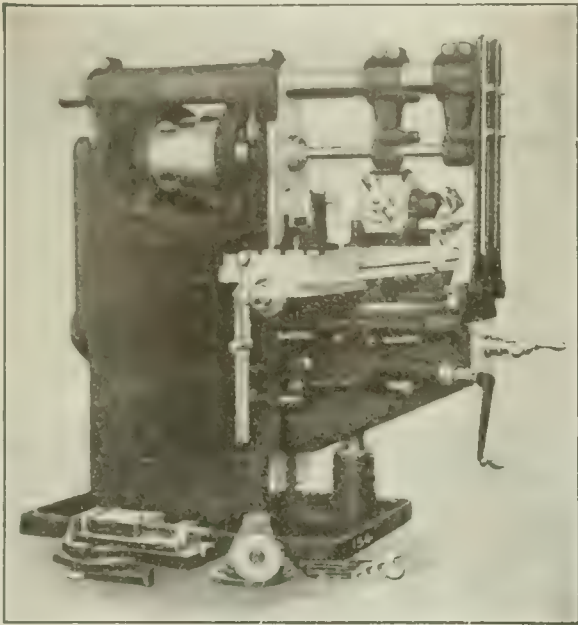
**ASK US**

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# FORD-SMITH MILLERS

Attachments



No. 2 Full Universal

High productive service, efficiency, durability, thorough workmanship, best material and convenience in operation—all of these most necessary points are typical of Ford-Smith Milling Machines.

Superior standards in manufacturing coupled with rigid inspection of each detail of work guarantee accurate production and service.

Built by

**The Ford-Smith Machine Co., Limited**  
Hamilton, Ont., Canada

# MAC KINNON STEEL CO., LTD.

*Engineers, Manufacturers  
and Erectors of Steel  
Structures*

Industrial Bridges, Buildings,  
Towers, Smoke Flues and  
Stacks, Chutes, Coal Bins, Ore  
Bins, Tanks, Cranes, Engine  
Houses, Grain Elevators, Der-  
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Structural Steel and Steel Plate  
Work, and a combination of the  
two lines.

*Prompt Deliveries Assured.*

**MacKINNON STEEL CO., LIMITED**  
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# Electrite

Electric furnaces,  
automatically  
regulated, the  
most modern  
methods, and the  
introduction of  
Uranium — make  
this a steel of  
truly remarkable  
cutting proper-  
ties.

We know "Elec-  
trite" cannot be  
bettered — and  
stand ready to  
prove it to you.

LATROBE

ELECTRIC STEEL CO.

LATROBE, PA.

# High Speed Steel

# uranium



# STEEL *for* Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

**Nova Scotia  
Steel and Coal  
Co., Limited**

Head Offices:  
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Western Sales Offices:  
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Steel Ingots  
by the  
**HARMET**  
Liquid Process



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Columbia River Packers' Association  
Astoria, Oregon

10/16/18

Magnolia Metal Co.

Gentlemen:—Engines, Line Shaft Bearings, Thrust Collars, Thrust Shaft Bearings, Stern Bearings and general equipment of our Alaska Fleet of Fishing Vessels are regularly inspected and repaired at this port. We have been using your MAGNOLIA METAL for this work with entirely satisfactory results.

Yours respectfully,  
COLUMBIA RIVER PACKERS' ASSOCIATION,  
J. A. BERG, Foreman, Machine Shop.

*Sold by Leading Dealers Everywhere, or*

**MAGNOLIA METAL CO.**

**OFFICE and FACTORY: 225 St. Ambroise Street, MONTREAL**





Cast Nichrome  
Cyanide Pot.

## Cast "Nichrome" Heat Treating Containers

Carbonizing and annealing boxes and other heat treating containers must be durable to withstand the action of heat during operation.

Cast iron, cast steel, structural steel and wrought iron receptacles crack, grow, scale or warp, their use is inefficient, involving costly maintenance due to additional expenses for labor, fuel, material and constant replacement.

Cast Nichrome boxes, pots, tube and retorts guarantee uniform high quality of product, increase the capacity of the plant, and reduce the cost of heat treatment.

Write for further particulars.

Manufactured under Henderson Patents.

**CANADIAN DRIVER-HARRIS Co., Ltd.**

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HARRISON, N.J.

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# CANADA FOUNDRIES & FORGINGS LIMITED

## ENDURANCE TOOLS

NEVER WEAR OUT



PIPE THE WRENCH—WRENCH THE PIPE

Canadian Billings & Spencer Plant  
Welland, Ont.

## Crucible AND Open Hearth Steel Tool Steel

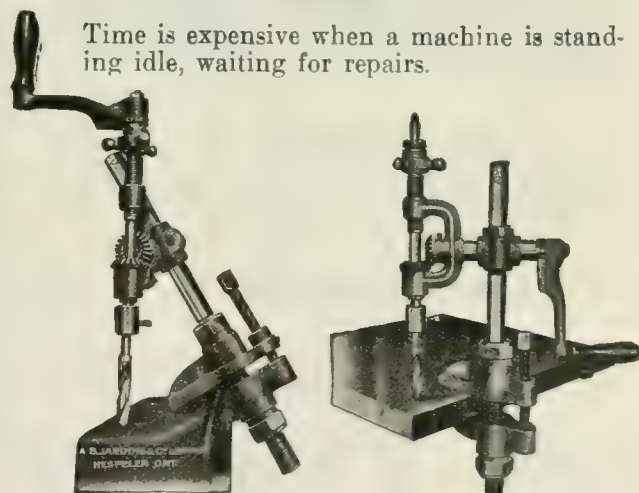
**"ARGO"** BRAND  
HIGH-SPEED STEEL

The John Illingworth Steel Co.  
1856

Frankford, Phila.  
New York Office 217 Broadway

RALPH B. NORTON, AGENT  
Montreal, Canada

## Jardine Universal Ratchet Drill



Time is expensive when a machine is standing idle, waiting for repairs.

On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, \$26.50 net  
Sold by all Machinery and Supply  
Houses

**A. B. JARDINE & CO., Limited**  
HESPELER, ONTARIO



# "WACO"

## THE HIGH SPEED STEEL

**MARSHALL, SON & BUNNEY**  
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR  
**WM. ATKINS & CO., LIMITED**  
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ALL SIZES  
IN STOCK

### NOVO-SUPERIOR

HIGH SPEED STEEL  
INTRA STEEL GIBRALTAR STEEL

Tool Steel for Every Purpose  
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters,  
Files, Etc., Music Wire for Springs, Steel Balls.  
Cold Rolled Tool Steel in Strips and Sheets  
Circular Saws, Machine Knives.

**PILOT STEEL & TOOL COMPANY,**  
LIMITED  
332 St. James Street, Montreal

*Sole Agents for*  
**JONAS & COLVER, LIMITED** **H. BOKER & CO., Inc.**  
Novo and Continental Steel Works, New York, N.Y.  
Sheffield, Eng.

### The Canadian Disc Sander is 90% Dustless

Think what a godsend that is to the pattern shop! Hundreds of prominent concerns are profiting immensely by using these sanders.

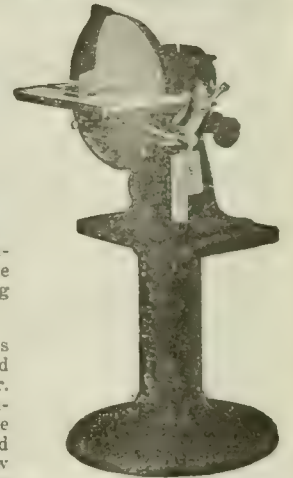
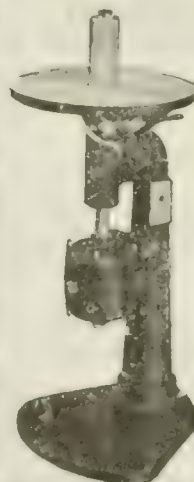
Two types of Canadian sanders are built—the Disc Sander and the Oscillating Spindle Sander.

Both machines are equipped with New Departure ball bearings

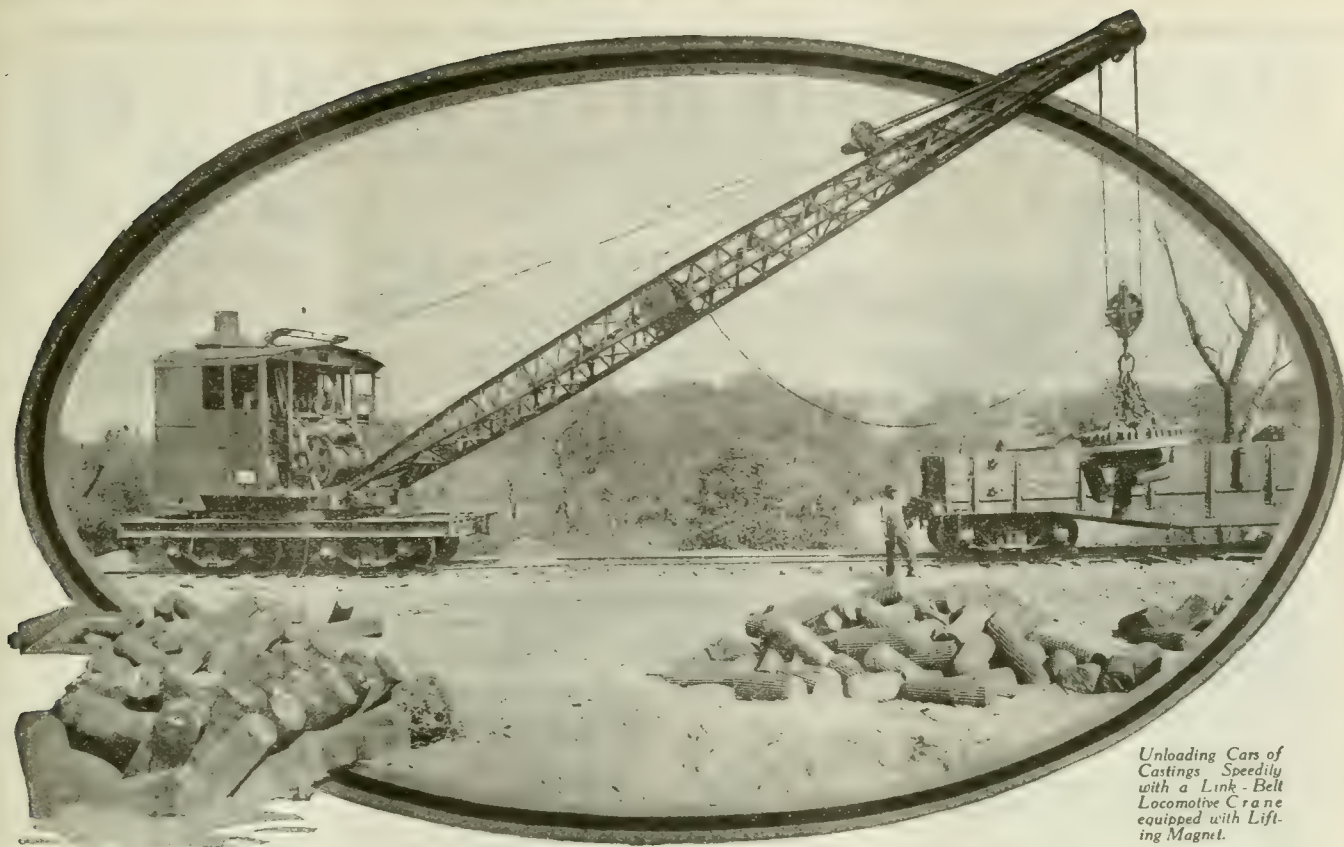
and General Electric motor. The table in each case can be tilted by a hand adjustment, 45 degrees down or 15 degrees up. Power is obtained by plugging into a lamp socket. Canadian Sanders are extraordinarily well built and are guaranteed against all defects.

*Ask for Bulletin and Prices*

**Canadian Sander Mfg. Co.,**  
Incorporated  
Brockville, Ont.







*Unloading Cars of Castings Speedily with a Link-Belt Locomotive Crane equipped with Lifting Magnet.*

## Speed Up Your Unloading with a Link-Belt Locomotive Crane

**N**O matter what kind of materials or products you load and unload, or handle around your yard, a Link-Belt Locomotive Crane will do the work quickly and at a low cost.

A crane is a great labor-saver. It is a reliable machine which can be kept on the job every day, and can be depended upon for reliable service.

Equipped with a grab bucket it will unload and store coal; fitted with a hook block it can handle miscellaneous loads of any kind, and with the electric lifting magnet attachment as shown in the illustration it can handle iron and steel, scrap, etc.

Let our experienced engineers look over your present handling methods and make recommendations. Catalog No. 370 on request.

**CANADIAN LINK-BELT COMPANY**  
LIMITED

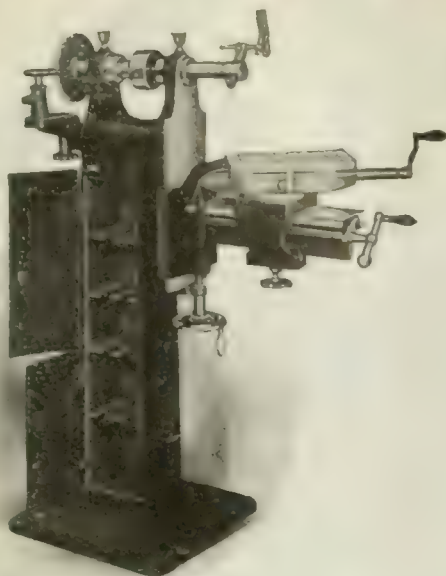
WELLINGTON AND PETER STREETS, TORONTO

**LINK-BELT**  
**LOCOMOTIVE CRANES**

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GARVIN No. 3, Universal Cutter  
and Surface Grinder  
Use Code—Banish

## From Cutters and Tools Kept Sharp on GARVIN No. 3 UNIVERSAL CUTTER AND SURFACE GRINDERS

Simple      Light Running      Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14" x 6"; SURFACES, 9½" x 6"

For Further Information ASK YOUR DEALER  
or WRITE US DIRECT

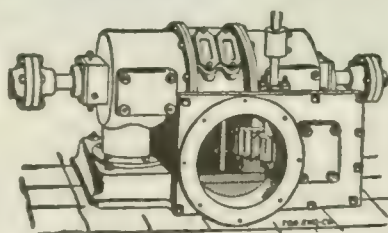
**IMMEDIATE DELIVERIES**

*Send for Complete Catalog*

**THE GARVIN MACHINE COMPANY**  
Spring and Varick Streets      (Visitors Welcome)      50 Years New York City

Manufactured by

## WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts. Can supply complete equipment, including flume, turbine and power transmission.

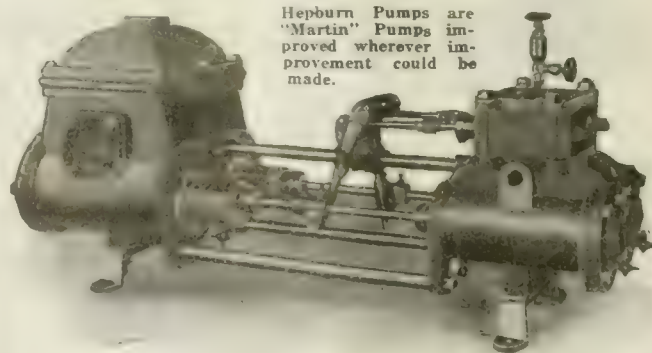
Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

*We solicit your inquiries.*

**THE J. C. WILSON MFG. CO.**  
LIMITED  
BELLEVILLE, ONTARIO

## Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

**JOHN T. HEPBURN, LIMITED**

18-60 Van Horne Street

Toronto, Ontario



# P&J AUTOMATICS

## *For Every Service*

Built in three sizes : 5-A, 6-A, 7-A Models, for automatically turning, boring, forming, threading and facing duplicate parts up to 40 inches diameter and 15 inches long.

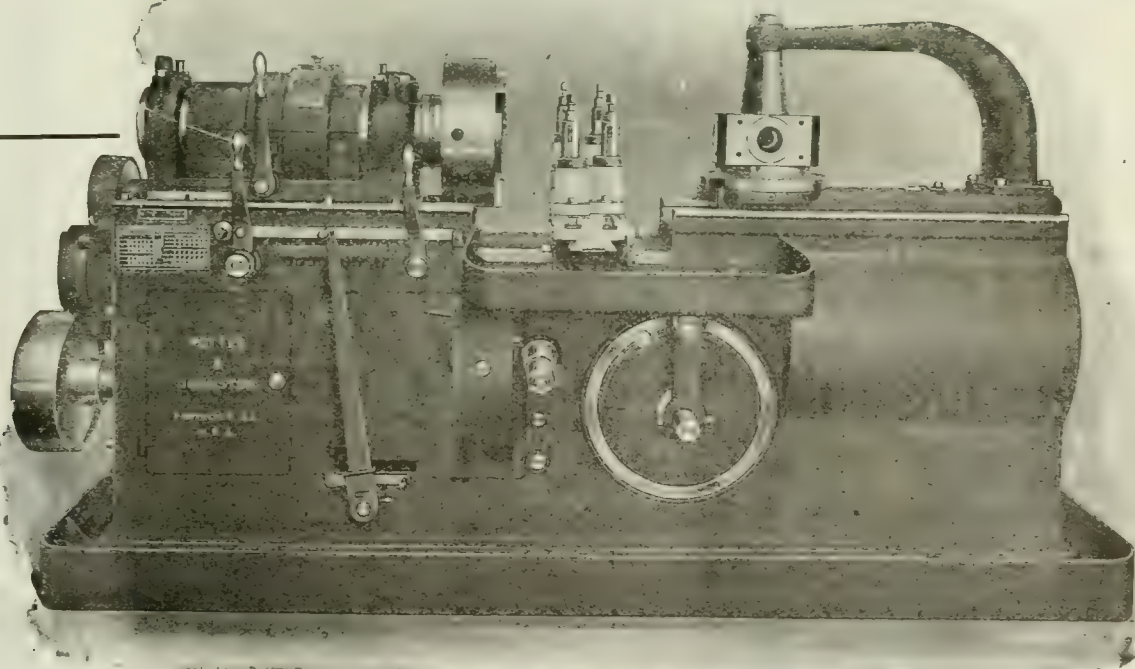
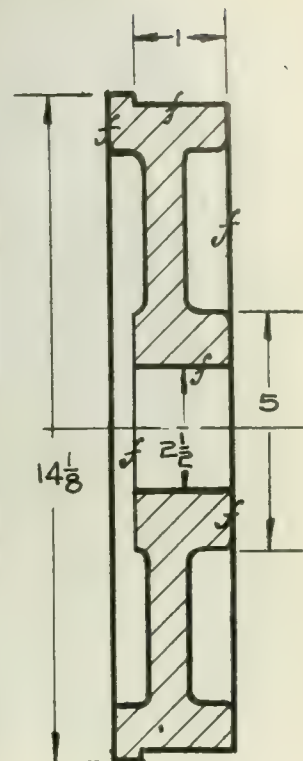
Here we have illustrated a gear centre machined where marked "f." Two operations are necessary for finishing this piece.

This is the class of work where one attendant operates from two to six machines.

This means increased production.

Investigate.

Bulletin No. 39.



6A  
Manufacturing  
Automatic

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

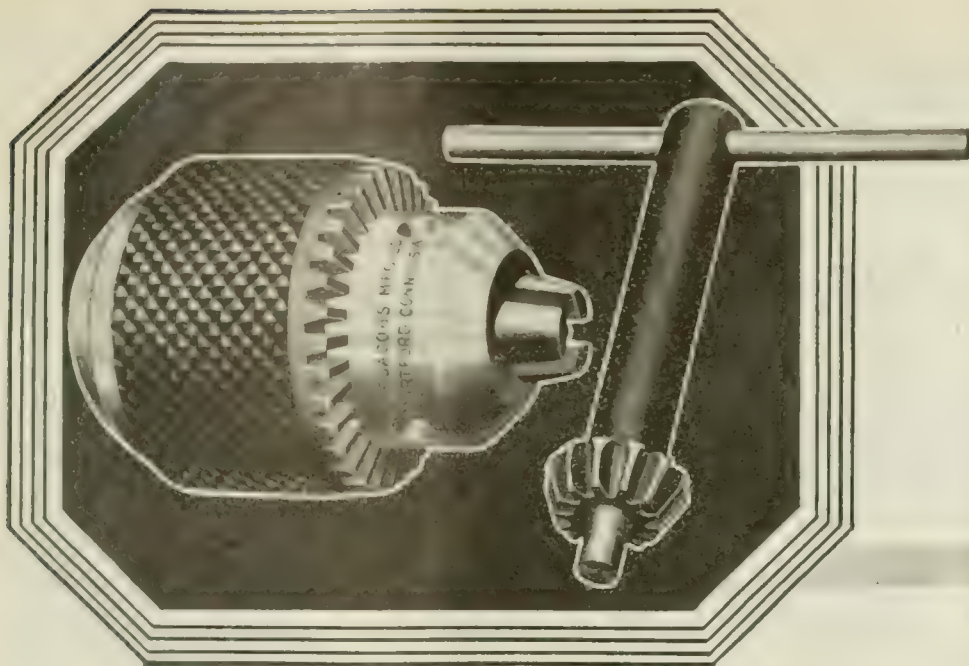
**ROELOFSON MACHINE & TOOL CO., LTD.**

HEAD OFFICE: 1501 ROYAL BANK BUILDING, TORONTO, CANADA

WORKS AND WAREHOUSE: GALT, ONTARIO, CANADA

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## The Man That Does The Work

Employers of labor are giving more time and sympathy to the mechanic's view of the job.

Men enjoy working with up-to-date, "no fuss" tools and equipment.

The largest, prosperous, most efficient factories in the world have installed Jacobs Improved Drill Chucks to aid their workmen and conserve their energy, time and temper.

Their 16 years of continuous and ever-growing service have made them the dominant chucks where reputation must be built on operation.

Made in 6 different models  
in 12 styles ranging from  
13/64" to 1".

**THE JACOBS MFG. CO.**

Dept. C.M.

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## *The toolmaker says:*

"Yes, I've got quite a number. No more, probably, than most toolmakers, but quite a number just the same. But then, I ought to have a lot of 'em. I've been buying Starrett Tools ever since I was an apprentice.

"You know my work calls for pretty close limits, and some way or other I've got a feeling of confidence in Starrett Tools that makes it easier for me to do good work.

"When did I get my first Starrett Tool? Oh, somewhere back in the 80's. In fact, it must have been pretty soon after the Starrett factory started. There's one thing that always impressed me. Right from the start, Starrett Tools have been designed and made by men who knew machine shop practice. You know, practical men. And somehow it shows in the quality of the tools."

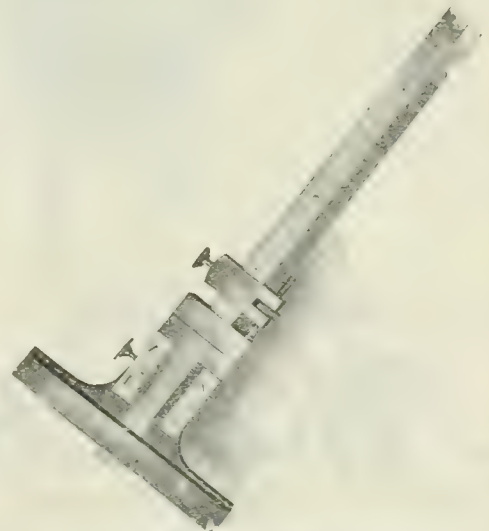
### **The L. S. STARRETT COMPANY**

THE WORLD'S GREATEST TOOLMAKERS  
Manufacturers of Hack Saws Unexcelled  
**ATHOL, MASS.**

Accuracy, utility, and quality are built into every Starrett Tool. Write for Catalog No. 213



## **Starrett Tools**



42-988



*Standard the  
World Over*

# "THE RACINE"

**HIGH SPEED METAL  
CUTTING MACHINE**

**Reduces  
Blade Expense**



Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

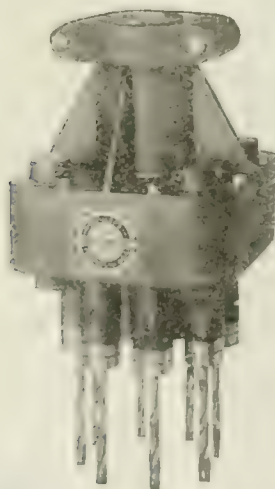
There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

*Use "Racine" H.S. Tungsten Power Blades*

**Racine Tool & Machine Co.**  
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## 2 Minutes or 20?

**This Is The Vital Question**



Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time and cost.



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Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 217 Stanwix St., Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mch. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio; John M. Howett, 18 W. Second St., Dayton, Ohio; 881 Ellicott Sq., Phone Seneca 2033, Buffalo, N.Y.

**The Canadian Fairbanks-Morse Co., Limited**

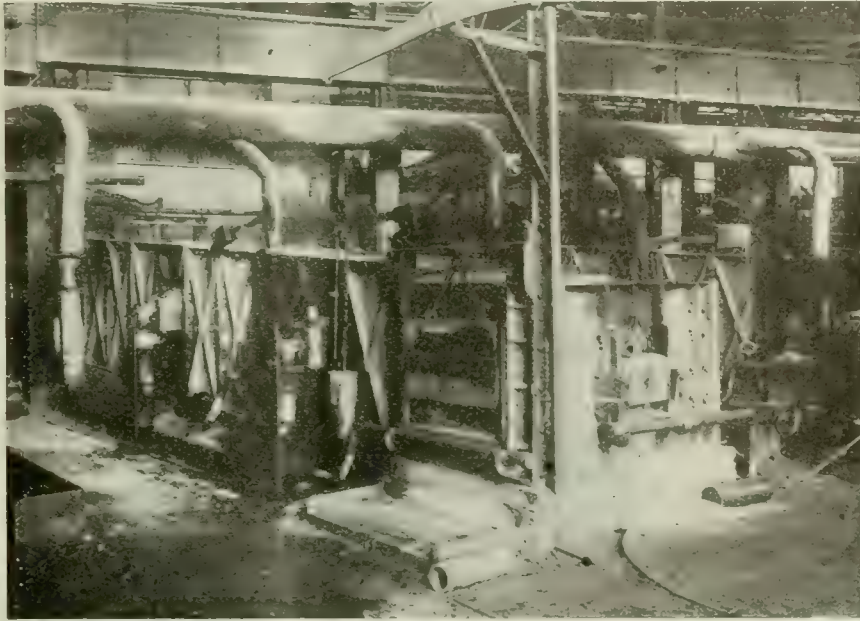
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# Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



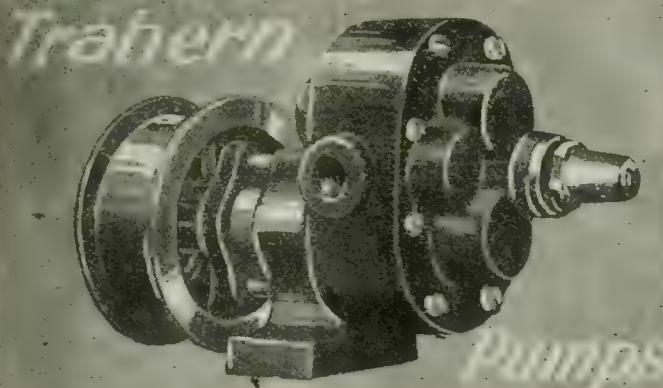
Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

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**Mechanical Engineering**

Company, Limited

Room 308, Bank of Toronto Bldg., Montreal  
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TRAHERN LUBRICATING PUMPS are for use on metal working machines of all kinds: planers, milling machines, gear hobbers, lathes, drill presses, saws, etc.

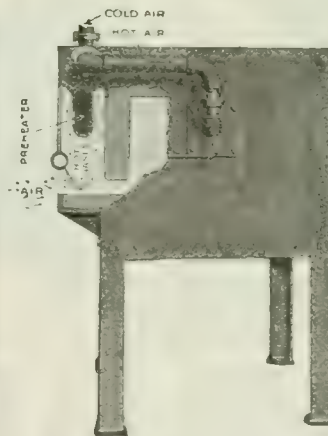
TRAHERN PUMPS are known to machine tool manufacturers the world over. Our customers are satisfied customers and install Trahern Lubricating Pumps on their machines as a regular equipment before leaving their factories.

Write for list of firms using TRAHERN PUMPS, then you will not have mere assertions but PROOF.

Try us and see that we have not overstated the facts.

**Trahern Pump Co.,** Rockford, Illinois

## ECONOMIZER FORGE



Showing deflection of hot gases, with induced air toward the furnace, and the preheating of air for combustion.

It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into the forge shop.

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Canadian Representative:

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128 Bleury St., Montreal, Canada





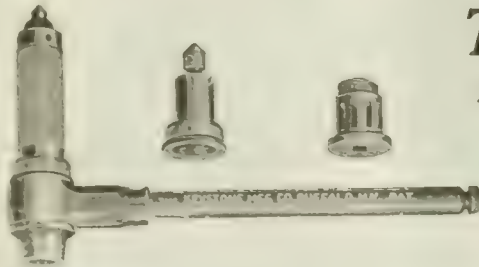
# "Keystone Quality" Will Still be There After Long Use Has Worn Away The Name



We like to think of that.

We like to think that the reputation of Keystone Tools is built upon a foundation of service with **Quality** the Keystone rather than a copyrighted name. For it is conceivable that imitators, or even the whims of courts, might rob us of our copyrighted name. But who could take "Keystone Quality" from Keystone Tools?

Write for name of nearest dealer.



## The Keystone Mfg. Company

Buffalo, N.Y., U.S.A.



# HOYT METALS

"Frost King"  
"Trojan"  
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BABBITS

Hoyt Metals have been used with great success for many years. Put them to the test and you'll soon see a difference in your babbitt cost.

All elements entering our cast mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which they are designed.

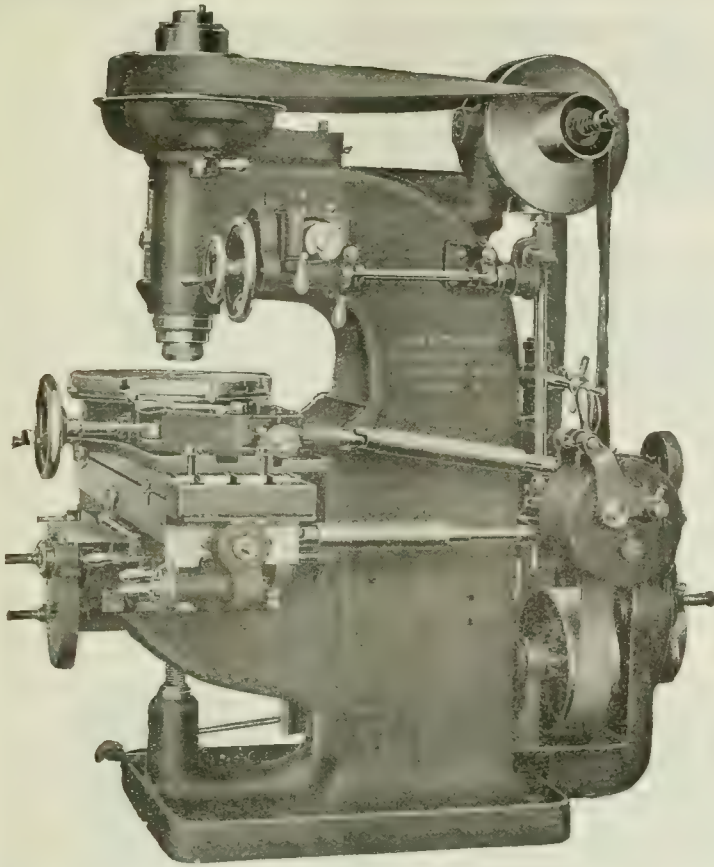
Annual sales over \$1,000,000.

**Hoyt Metal Co., Toronto**

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# MILLERS

**"THE MACHINE  
THAT GIVES THE  
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All gear driven spindles lack flexibility and induce vibration through the unavoidable progressive development of back lash between gears resulting in vibration and hammer action which has a crumbling effect upon the cutter teeth and leaves chatter marks on the finished work.

With the Becker Elastic Belt Drive this gearing is eliminated.

Write for Circular 0-702.

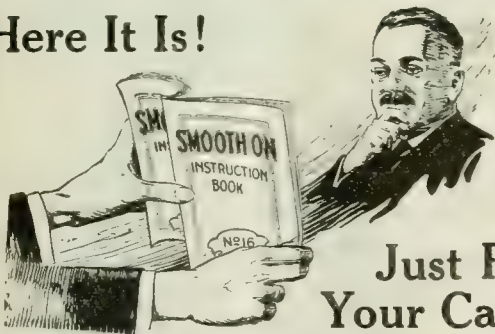
**Becker Milling Machine Co.**

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A. R. Williams Machinery Co., Ltd., 64 Front St. W., Toronto  
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**Here It Is!**



**Just Fits  
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Its 144 pages contain descriptions of many instances of time and money saved in this way. It shows you "how it is done"—quickly and economically—without dismantling machine or piping.

Write today for your copy.

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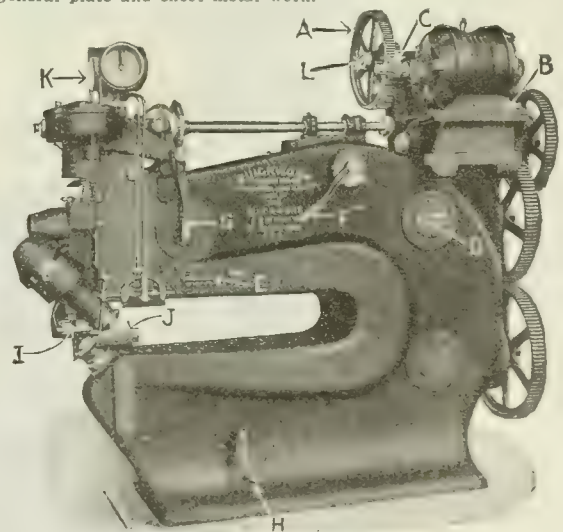
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### ROTARY SHEARS

MADE IN 7 SIZES.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 24, 1913

**SAVES 50% TO 90%**

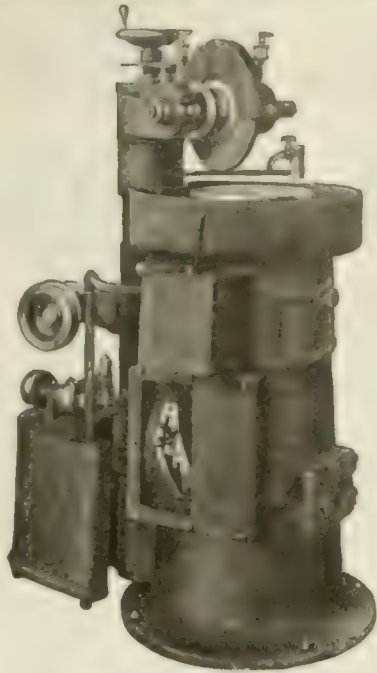
Eliminates Oxyacetylene Cutting and Plate Planing.  
Write for Catalogue No. 60.

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Cable address: "QUICKWORK."  
Codes: W. U. and General.

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## Bristol 12-inch Rotary Precision Surface Grinder

Built for rapid production on grinding work.

It handles work either singly or in multiples within the capacity of the chuck and not thicker than 6-in., and grinds within quarter thousand in. of manufacturing accuracy.

And it is built to last.

It is provided with exceptionally long bearings throughout, especially in the back column. This prevents the wear, which is very slight, from affecting the accuracy of the grinder. The Back Column is made to swivel four degrees, which allows concave or convex grinding.

Bristol Rotary Surface Grinders are made in several types and sizes and are regularly equipped with 8-in., 12-in., and 16-in. magnetic chucks, either belt or motor driven and for dry or wet grinding.

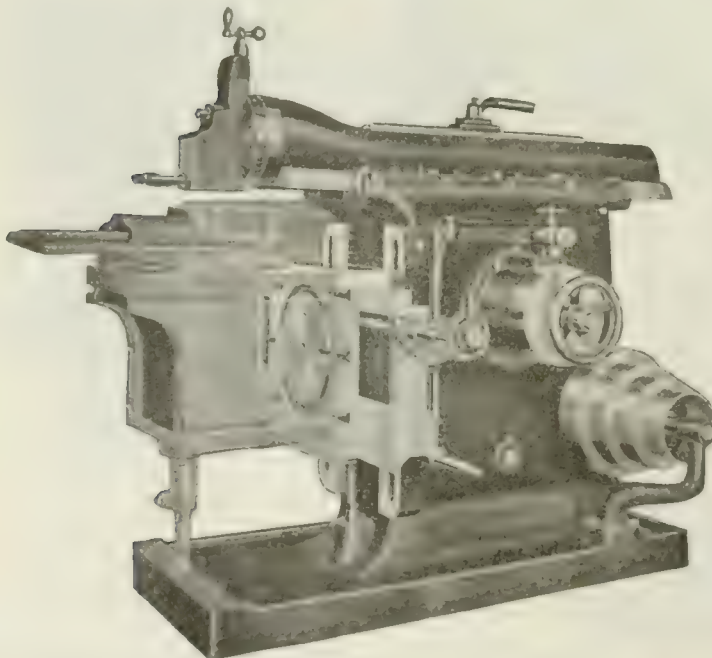
Our Bulletin describes the many good points fully. Send us your name and address and we'll gladly mail you one.

*Grinds within .0004 in. of absolute Accuracy*

**BRISTOL MACHINE TOOL CO.**  
SUCCESSORS TO C. G. GARRIGUS MACH. CO.  
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Built in three sizes: 16 inch, 20 inch and 24 inch.

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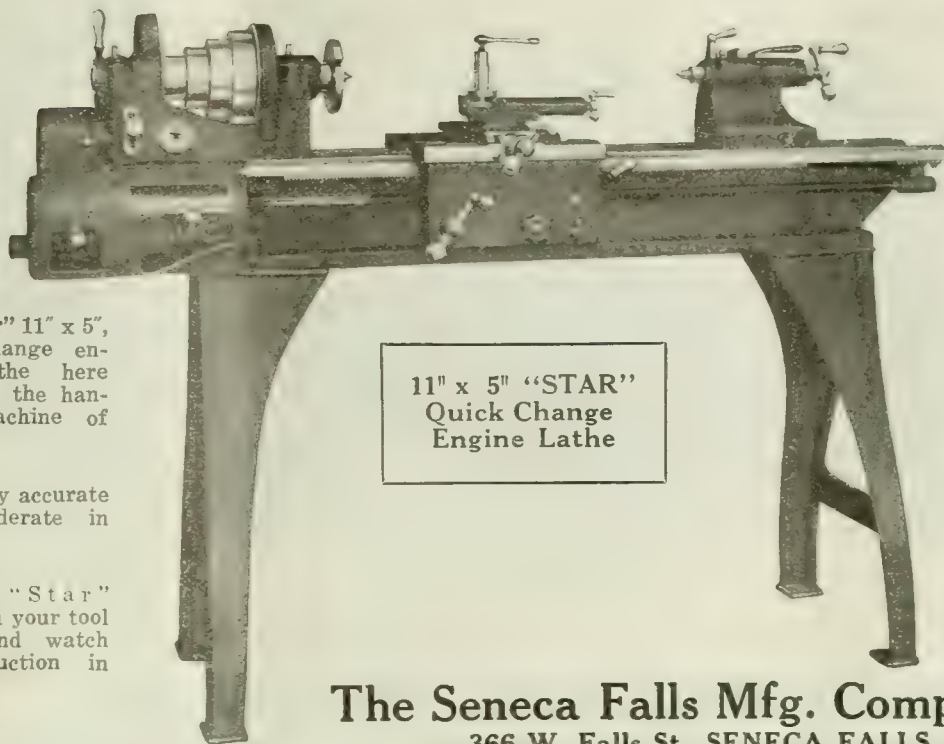
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# "STAR" TOOL ROOM LATHES



The "Star" 11" x 5", quick change engine lathe here shown is the handiest machine of its kind.

Extremely accurate and moderate in price.

Install "Star" Lathes in your tool room, and watch the reduction in costs.

11" x 5" "STAR"  
Quick Change  
Engine Lathe

"Star" Lathes are built in four sizes, 9, 11, 12, and 13-inch, with a full line of attachments available.

They have the strength for every kind of work within capacity, every improvement for rapid operation, and an accuracy that classifies them as precision lathes.

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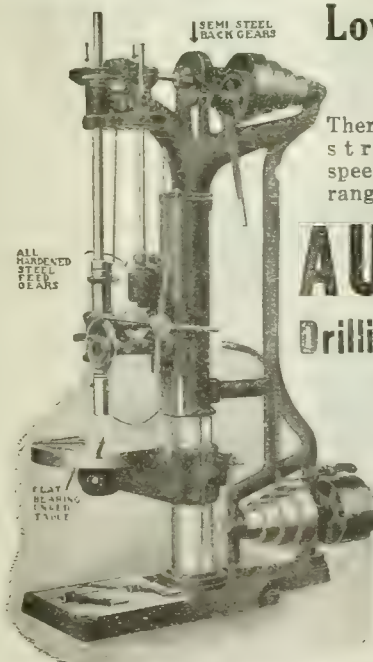
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## Production of Rare Quality at Lowest Labor Costs

There is unusual strength, accuracy, speed, convenience and range in

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You can use them to great advantage on any work in your shop that's suitable for a machine tool of this kind. The operating is easy and the labor cost comparatively low.

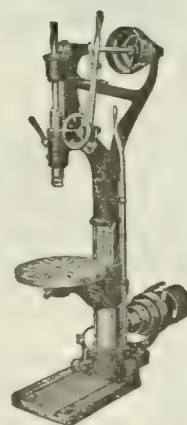


Drop a line for full particulars and specifications.  
Stationary Head Sizes 20"—21"  
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**The Aurora Tool Works**  
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Complete line. 8-inch to 50-inch swing  
**Gang Drills.—Horizontal Drills.**

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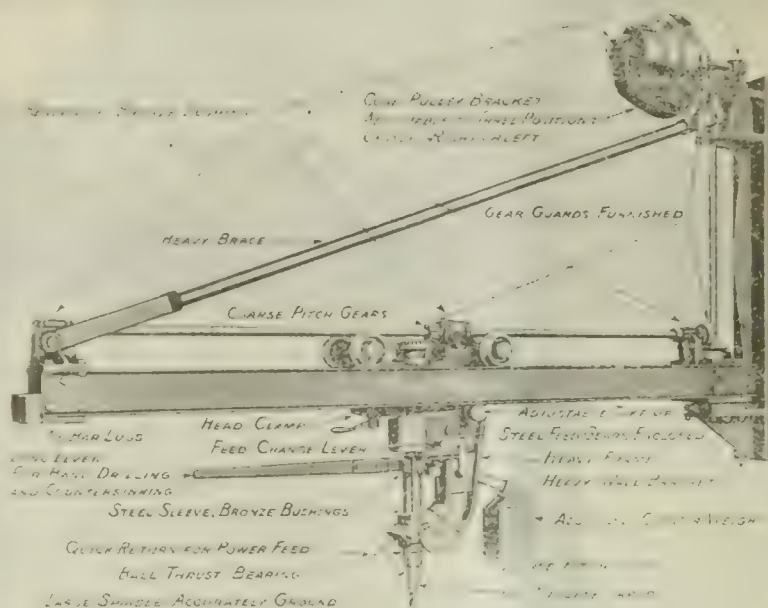
You can't do better than install this Wall Radial Drill in your plant. We'll say you won't have it in operation more than a month before you will begin to congratulate yourself on your judgment in adding this machine to your equipment. Materials and workmanship that you can depend upon to the limit are features of the construction, and our bulletin will give full details.

**GET IT TO-DAY!**

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

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We make Machinery Guards of all kinds.

Metal Lockers for Clothes.

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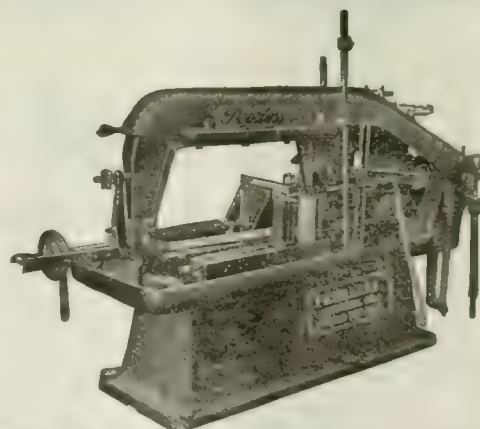
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Machines do 50 to 100% more work



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### The Balance Lift of the Peerless

automatically raises the blade for the return stroke. This greatly prolongs the life of the blades, economizes power, and increases production. There are more good features which we shall be glad to acquaint you with.

The Peerless assures you the peak of production at very lowest cost. Write for full details.

**PEERLESS MACHINE CO.**

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RACINE, WISCONSIN



# Wherever Pipe is Cut or Threaded Economically

The probability is two to one that it's a

**Williams** Pipe Machine

that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

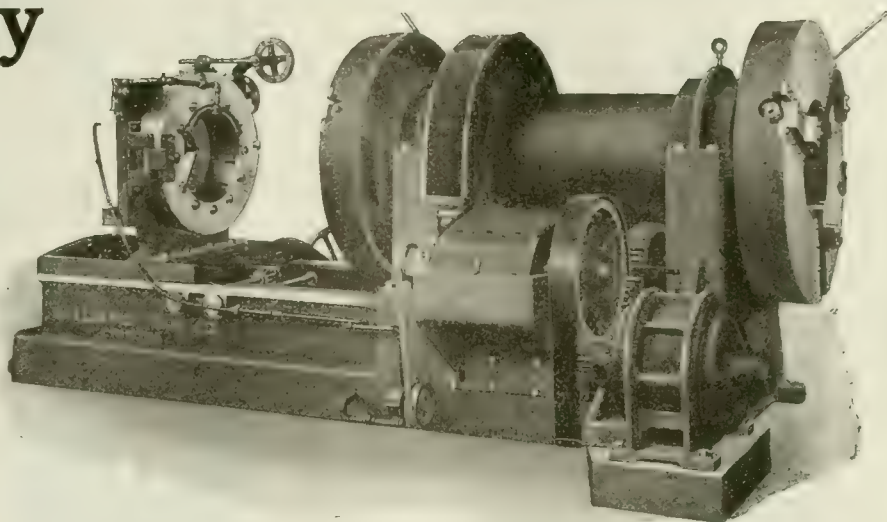
It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½" to 12". Also nine other sizes to meet your requirements.

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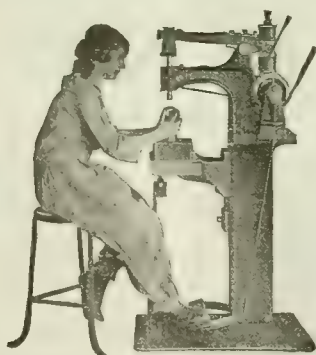
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### HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".

A rivet in two seconds, size ¼" to ⅝".

A rivet in three seconds, size 7/16" to ⅞".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

Send us sample assembly parts with rivets or sketch of your work,

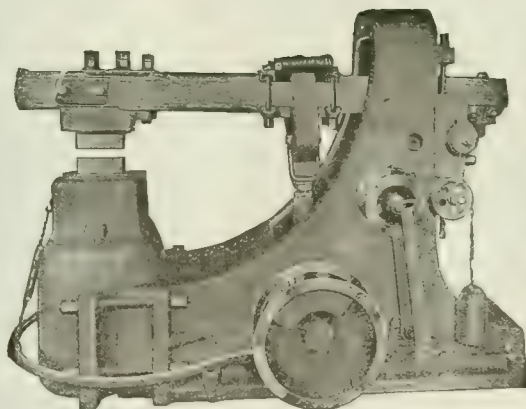
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Let us shoulder your riveting problems.

Send for the High Speed Hammer Book.

**THE HIGH SPEED HAMMER COMPANY, INC.**  
ROCHESTER, N. Y.

## Strike While the Iron's Hot



Send  
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### The Rochester Helve Hammer

Any blow, long or short, fast or slow, heavy or light—any length, weight and force of blow instantly secured on the Rochester "Helve" while the machine is running. This feature alone saves so much time where there is a variety of small work to be forged, swaged or welded, that it recommends the tool without reference to its other distinctive features. Made in 6 sizes, 2 styles of frames; 25-lb. to 100-lb. heads. For Welding and General Forging the "Rochester" is peerless in efficiency. Get our Helve Hammer Book.

**THE WEST TIRE SETTER CO.**  
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## Note On Grinding

No. 72A

### Grinding Wheels Versus Steel Wheels in Cleaning Cast Iron Gears

**C**LEANING sand and metal irregularities from between the teeth of cast iron gears is an operation of considerable importance for manufacturers of certain types of machinery. In the past and at the present time in some plants, a steel wheel running at high speed is used for this work. By this method the sand is removed nicely, but the irregularities in the gear itself cannot be removed. Instead they must be filed out, and this is a slow hand operation.

A test has recently been completed in which a 12 x 1 1/2 x 1", grain 46 Crystolon rubber wheel was used. The Crystolon wheel of course not only removed the sand, but also ground out the metal irregularities and produced an excellently finished gear, much more satisfactory than the filed gear.

The wheel was mounted on a Norton bench machine and the speed maintained at 3,000 r.p.m., or a little more than 9,000 surface feet per minute. Four-inch flanges were used. The operator using the steel wheel received a weekly wage of \$20, whereas it was necessary with the rubber wheel to have a better and more careful man, who was paid \$22. The filers worked on a piece work basis and received four cents per 100 teeth.

In using the grinding wheel, the filing was entirely eliminated and the operation was not as hard on the operator, inasmuch as he did not have to use as great pressure as with the steel wheel. Besides, the grinding wheel turned out over 40% more gears in a given period than could be taken care of with the steel wheel, not considering the time used for filing. The cost was reduced from 99 cents per 1,000 teeth to 48 cents, the chief saving being the expense of filing.

The cost per 1,000 teeth only included wages and cost of the grinding wheels. The steel wheel, file, and overhead expense were not considered. A very considerable additional saving would no doubt have been noted, had these been taken into consideration.

**NORTON COMPANY**

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec Que.

Grinding Wheel Plants, Worcester, Mass.

Electric Furnace Plants	New York Store	Chicago Store
Niagara Falls, N.Y.	Chippawa, Ont.	151 Chambers St.
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**Dominion Forge & Stamping Co., Ltd.**

WALKERVILLE, ONTARIO

Toronto Office: 206 Excelsior Life Bldg.

**TRADE MARK**

Our contribution to the demand for increased production is a better file.

A trial of either P. H. or IMPERIAL Files will prove this.

We searched the continent until we found the best file steel procurable—Clay Crucible Cast Steel.

We employ only skilled workers.

Result: "They cut faster and wear longer."

**INGERSOLL FILE COMPANY, LIMITED**  
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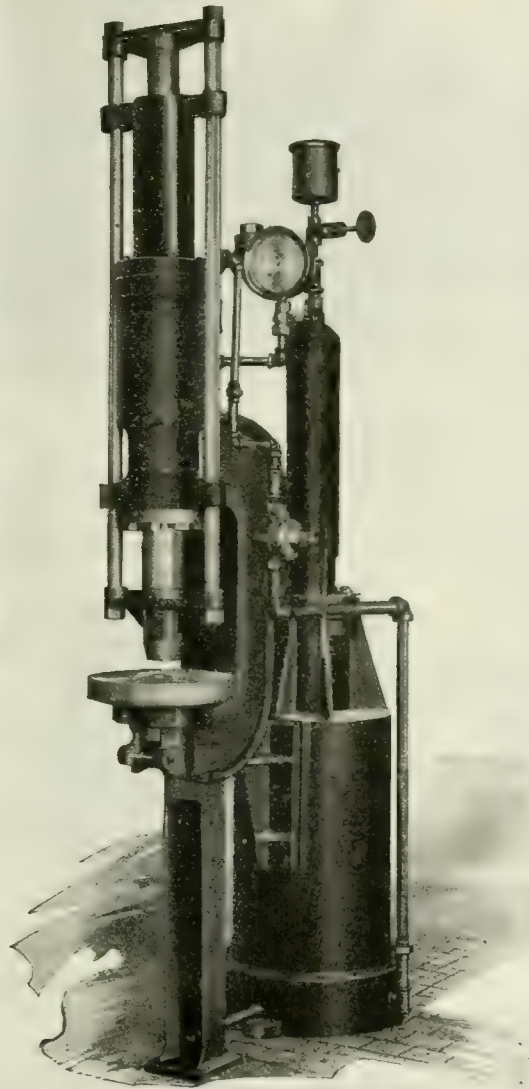
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**"METALWOOD"**

*DESIGNS and*  
**DEVELOPMENTS**



*The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.*

*By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.*

*The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.*

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*High Speed Hydraulic and Hydro-Pneumatic Machinery*  
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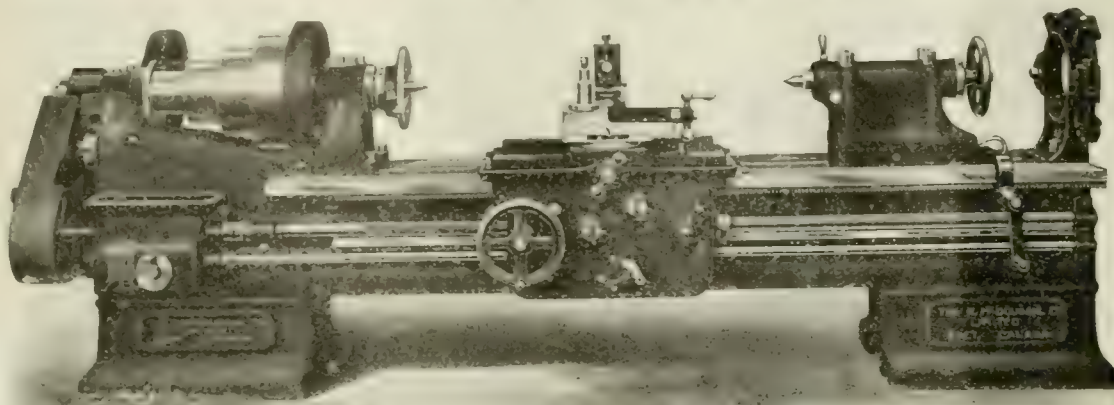




Every part of our Gap Lathes bears the "earmarks" of expert workmanship.

## McDOUGALL GAP LATHES

And every feature is proof of our aim to produce a machine of unusual merit.



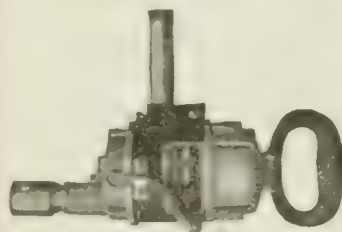
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**THE R. McDOUGALL COMPANY, LIMITED, GALT, ONTARIO**

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## U. S. Electric Drills and Grinders

Save Time, Labor and Money



### 3 SIZES

3-16 in., W.G.T. 6 lbs.  
1/4 in., W.G.T. 9 lbs.  
5/8 in., W.G.T. 12 lbs.

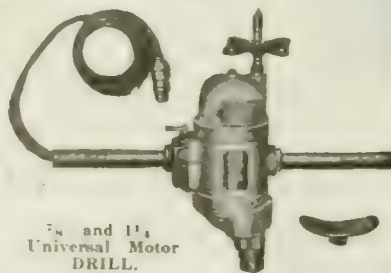
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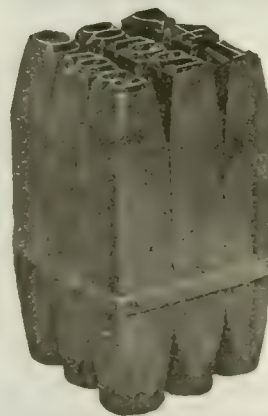


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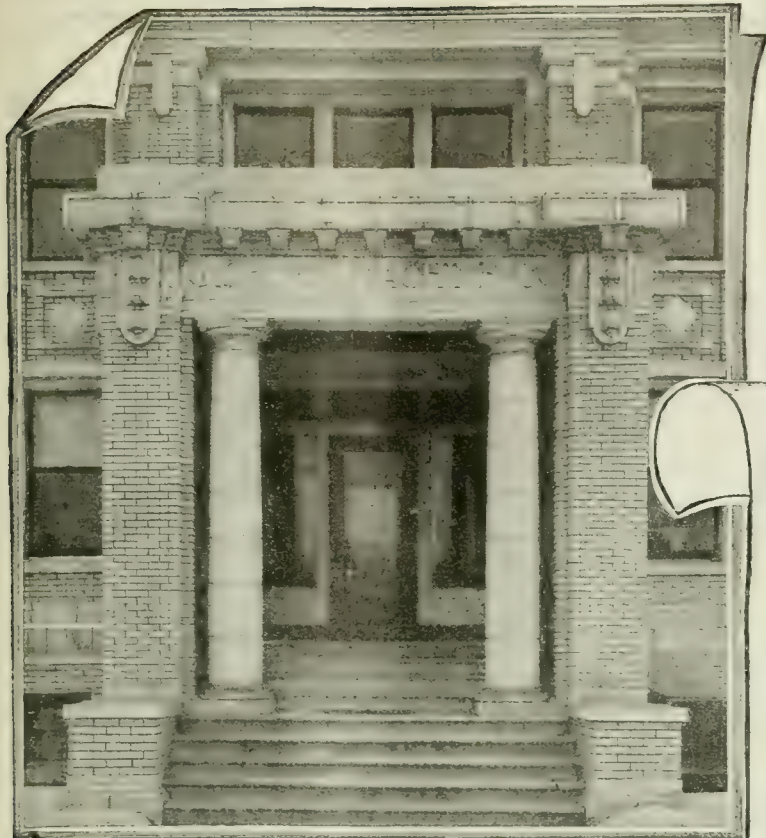
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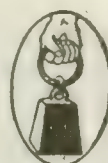
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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

Vol. XXI. No. 17

October 31, 1919

## Do You Believe That the File is a Fine Tool?

Judging by the Various Steps in Its Manufacture We Would Say  
Yes. Herein is Described How **Ingersoll Files** Are Made, Right  
From the Rough Blank to the Finished Product

By J. H. MOORE, Associate Editor, Canadian Machinery

**S**UPPOSE we were to ask some type of machinists the question: "What is a file?" could you safely prophesy their answer? Ten chances to one they would hum and haw, and say that it was a—a thing to take off metal with.

This above statement may sound exaggerated, but it is unfortunately more truth than jest, for supposing we were to further question them regarding the care of a file, they would more than likely look at us in surprise, wonder at our ignorance, and remark: "Why a file don't need any special care."

Fortunately, however, this state of affairs is becoming less common, and the trend is pointing in the right direction, namely, that users of files are beginning to realize unthought-of possibilities in this machine tool.

### Is the File a Fine Tool?

We call the file a machine tool purposely, as it is as much a tool as any other cutting tool used on a planer, shaper, miller, etc. The machinist and tool maker at last is waking up to the fact that with proper care a file will last longer, and cut faster, than it would if handled in the ordinary careless style. Did you ever see the following incidents happen in your experience?

A tradesman has just completed the task of filing a piece to size, and feels that for the time at least he is through with his file. He opens the bench drawer, slams in the file amongst chisels, hammers and other miscellaneous tools. On next going to use the file he will soon remark to his next workman at the bench: "These files are absolutely no good. Last

time I used this one it worked fine, but now look at it, the teeth are all shot, and it won't cut worth a hoot."

Has the writer overdrawn the picture? He thinks not, for this incident has also been observed in his experience.

He has noticed a workman use one file handle for three or four files. Every time he changed from one file to another, the following procedure would be gone through: Bang went the handle of

the file, at the ferrule end, up against the vise, and out would come the handle. Next the other file would be placed tang in, on the handle. The vise was again resorted to, and bang went the file against the vise. Another very pretty and clever? trick is to bang the file against the vise sidewise, to knock the cuttings out of the teeth. Of course, all this helps to soon make the workman declare that these files are no good, etc., etc. He never seems to remember that there is such a thing as a file cleaning brush specially made for such purpose.

As we already commented, however, the outlook for a happier existence for the file is becoming apparent, and soon we hope to be able to report that the file wrecker is an oddity of the past.

### The Actual Manufacture

Leaving the care of the file for the present, and going into the actual manufacture of the file, may we ask the question: "How many readers know how a file is made?"

Not a great many, we will venture, so let us enter on a descriptive tour of the making of an Ingersoll File, from the rough stock, right up to the finished product ready for shipment.

To begin with, the material used is a high-grade crucible file steel specially made for the purpose. As readers are well aware, a file is either good or bad. There is no middle course. If the quality of steel is not there in the first place, no amount of workmanship will make it a good file. To stand up to the work, a file must first be made of the proper material. The firm whose product we are now about to describe, make it a special point to see that only

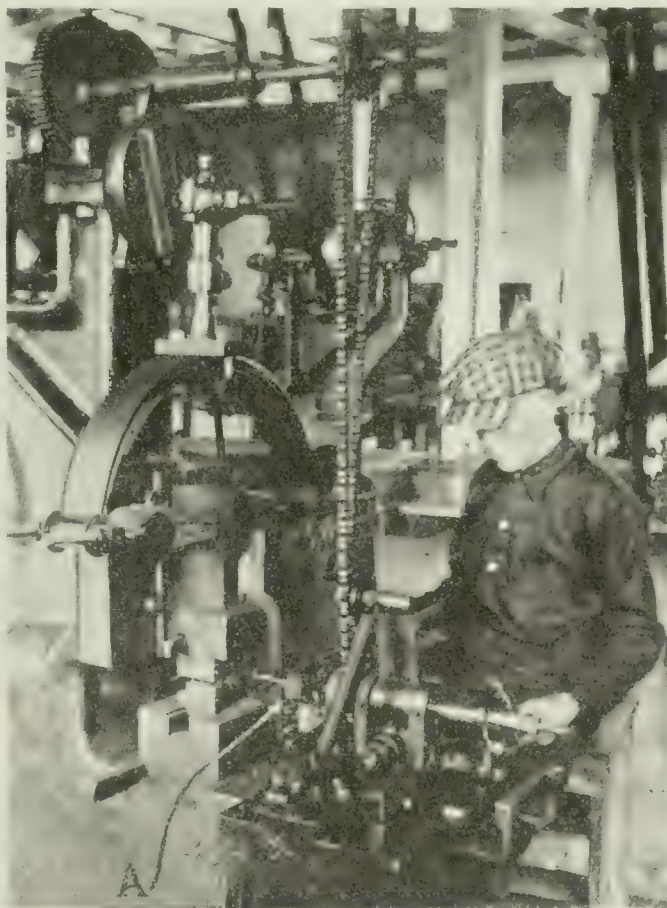


FIG. 1—AUTOMATIC TANGING HAMMER



the highest grade of clay crucible steel is used. Open Hearth Steel is used extensively in the manufacture of files, but the Ingersoll File Company maintain that Clay Crucible Cast Steel is the only steel which can give real re-

sults in files. All tests have conclusively proven this, according to them.

The stock is stored in racks of the usual design. This storeroom is located directly in connection with the forging department, so that the least possible

handling is done to the raw product before it actually starts on its various operations.

#### Forging Operations

The first operation on entering the forge shop is that of cutting off the



FIG. 2—POINTING FILE BLANKS ON BRADLEY HAMMER.  
FIG. 4—THE OLD STYLE OF GRINDING.

FIG. 3—ROLLING SQUARE FILE BLANKS.  
FIG. 5—NEW METHOD OF ACCOMPLISHING THE GRINDING.



stock in shears to the proper lengths to suit the various size files.

The next operation is that of forming, or blanking the file tangs. Of course, readers are all well aware what the tang of a file is, and by memory can picture the shape of this portion, on which the file handle goes.

On the smaller size files and up to the 8 in. size, these tangs are punched out on power presses, but on the larger size they are forged out on a Bradley helve hammer. Another method of producing these tangs is by rolling them out on a special rolling machine for the purpose.

These methods described are suitable for most shapes of files, but when triangular files are made, the procedure is somewhat different.

The file blanks are placed in a special chuck, A, as shown at Fig. 1, and the tangs are forged out by means of a special automatic hammer. The chuck already spoken of is driven by mechanism direct from the ram of hammer, by means of gears and chain, which can be plainly seen on the photograph. In this way the file blank revolves at the proper speed and produces an even and standard tang. The chuck is equipped with special ejector which shoots out the blank when finished without the operator touching it at all. This method of producing tangs has proved very efficient, and production figures are very encouraging.

The next operation is that of pointing the blank. By pointing, we refer to that portion of the file which is slightly tapered at its point. This work is accomplished in two ways, either by power hammer or rolls.

Fig. 2 illustrates the former spoken of method, the work being done on a Bradley hammer. Boys can readily do this work successfully. Some of the pointed blanks can be seen at A on this photograph. It will be noticed that these blanks are for fiat files.

At Fig. 3 we show the workman pointing square file blanks on the rolls. The die A comes round at proper time and accomplishes the operation. There are also shaping and sizing dies which come in from the side at portion marked B, but we do not show these in the picture. The work is being done on Coulter and McKenzie Rolling machine.

While these various operations have been going on the blanks have become hard through forging, so that it is now necessary that they be annealed.

#### The Annealing Process

This concern has made a special study of the annealing process and have installed a battery of six annealing furnaces of special design. As the manager, Mr. Swallow, remarked to the writer: "We secured the services of an Old Country brick setter for this work, not just an ordinary bricklayer, and explained our wishes to him. The result is that we have furnaces in a class by themselves. The fuel (which is oil) goes through special burners built by the company, which have proved so efficient that no other type is used."

A remarkable figure of economy was given to the writer in fuel consumption, and he passes it along for readers to likewise read. Twenty burners are used throughout this plant at the low cost of less than \$5 per day for fuel on all burners. The writer personally saw the bills, and other details, so can vouch for these figures.

To proceed with the annealing process, we will first mention that inside these furnaces the brickwork is so arranged that the flame is continuous in its action, a feature which will be easily understood. The blanks are all placed in annealing boxes and the flame never touches the blanks themselves. The work is heated up to temperatures around 1450 deg. Fah., according to the size of the file. Pyrometer is used, of course, to ascertain this heat.

The heat is now shut off and the work allowed to remain in ovens for at least two to three days, in order that they may be properly cooled.

After annealing they are straightened before going to the grinding operation.

#### Grinding Operations

It might be best to explain to readers not familiar with the peculiarities of steel, that, after annealing, there is a skin of considerable depth around the annealed blank which is decarbonized. This carbonless metal must be ground off entirely, as of course the decarbonized metal will not harden. This explains why the grinding operation is so important.

Roaks, and other surface defects, which, particularly in round files, might cause them to split on hardening, are also noticed after grinding, when the blanks can be rejected, but as a general rule the steel is of such uniform quality that very few blanks are turned back.

The grinding work is accomplished in two ways; the first of these being the old hand method. This style of grinding is illustrated at Fig. 4. Here we see the operator holding the round file blank to the grindstone by means of a special shaped hook. The blank is now ground until all the decarbonized material is taken off.

These huge stones range from 6 to 7 feet in diameter, and up to 11½ in. in width. This grinding operation is a costly one, as the stones do not last for any great length of time.

The second, and up-to-date method of grinding is shown at Fig. 5. Here the wheel is enclosed in suitable guard, all but the working portion A. The file blanks are held in a special plate B, which has rubber cushions attached to the same. This plate is placed in a sliding ram and traversed up and down the stone at a regular rate of speed. In addition to this, the wheel itself has a side motion, travelling sidewise while the ram carries the blanks up and down over the stone. This makes the wear on the stone even, and not only on one spot, which guarantees the blanks being ground perfectly true.

Other shaped files are ground by the same method, with holding plates of special shape to suit the file blanks.

#### Special Stripping Operation

The next operation to be performed is that of stripping the blank, or to use a more common expression, draw filing the blank. This work is accomplished on a machine specially built for the purpose.

Speaking of special machinery, it might be just as well to call readers' attention to the fact that this firm make whatever machinery they desire or require, as the file-making industry is something which is distinct in itself, and demands special equipment. They are well equipped to build up these various machines, as the next photograph will show.

At Fig. 6 we see a stripping machine practically completed and ready for work. To explain the action of this machine we would first call readers' attention to the crank A, which receives its motion from the tight and loose pulley seen to the left of this crank. The ram B in turn is driven backward and forward, from which the name draw filing comes. There are two holders for the file blanks C and D, which travel slowly back and forth with a sidewise motion, while underneath the ram B, at points directly above these holders, are placed finished files which accomplish the operation.

The operator rubs chalk on the blank being stripped from time to time in order to help the operation. After leaving these machines, the files are accurate in every detail, and ready for cutting.

#### The Cutting Operation

According to the size of the file they are cut on a small or large machine, and first for illustrative purposes we show Fig. 7. Here we see the girl operator about to feed the table A into the cutting chisel B. Depending on the size of file, width, etc., one or two files are cut at one time. In the case shown, two are being cut. We will make no special mention on this picture, but refer the reader to the next illustration, Fig. 8, which shows a larger machine from a different viewpoint.

We are looking from the working side in this case, and can see in detail the general construction of the machine. Two blanks are also being cut in this case, and can be easily seen in the photograph. A once more represents the travelling carriage. B the holder or cutting bed for the blanks. These beds are, of course, easily taken off or put on the travelling carriage, as the style of file blanks are changed. Each file machine has a set of these various sized beds.

The method of feeding carriage A is very simple. The handle D controls a nut, which in turn meshes with feed-screw E. On desiring the carriage to feed in, the operator places nut on screw; when on proceeding far enough he merely lifts the handle D, and brings the carriage back at once to its former and outside position. The rubber pressure block F is what gives the proper pressure and blow to the cutters. Of course the pressure is really controlled from the hand-wheel G, but the blow and rebound is taken up through the rubber block. It



takes considerable experience to make a first-class file cutter, as he must learn the art of knowing just what the proper pressure, angle, etc., on his cutter.

On looking at a properly cut file (that is by the ordinary eye) it should appear an even dark shade. Should it be improperly cut, light patches will show up at various spots, showing that the file is not up to standard. Such files are scrap, and are not sent out.

In addition to this eye test, the files are tested under a microscope, when even cutting, proper shaped teeth, and so on are all checked up.

The round file is cut in one operation by means of a special fixture, which revolves at the proper speed, while the table feeds in. A special feature on these

round files is the broken teeth as they are termed. These teeth are so arranged that proper clearance for file cuttings is made, and no clogging of the file results, but the cuttings drop away at once.

After cutting, the files are once more straightened before going into the hardening room.

#### The Hardening Process

On entering this room they are first washed in oakite, dipped in water, and lastly dipped in a special paste, and then dried.

The reason for applying this paste is as follows: These files are hardened in a lead bath, and if no protection was made for the teeth of the file, the lead would of course fill them up and render the file of little use. This paste fills

the teeth up before they are sent to the hardening pot.

They are now heated as shown at Fig. 9, being first heated in a lead bath, then dipped and tempered in brine water. This brine water system is always kept cool and fresh by a continuous-action pump system, which ensures a fresh supply at all times. The writer had the pleasure of watching the temperer at work on half round files, and had occasion to realize that tempering is indeed an art in itself.

The workman, for illustrative purposes, demonstrated the correct and the wrong method, each file being heated to a similar temperature. First he explained the way it should not be done. Taking the file from the lead bath, he dipped it into the brine, when it came out some-

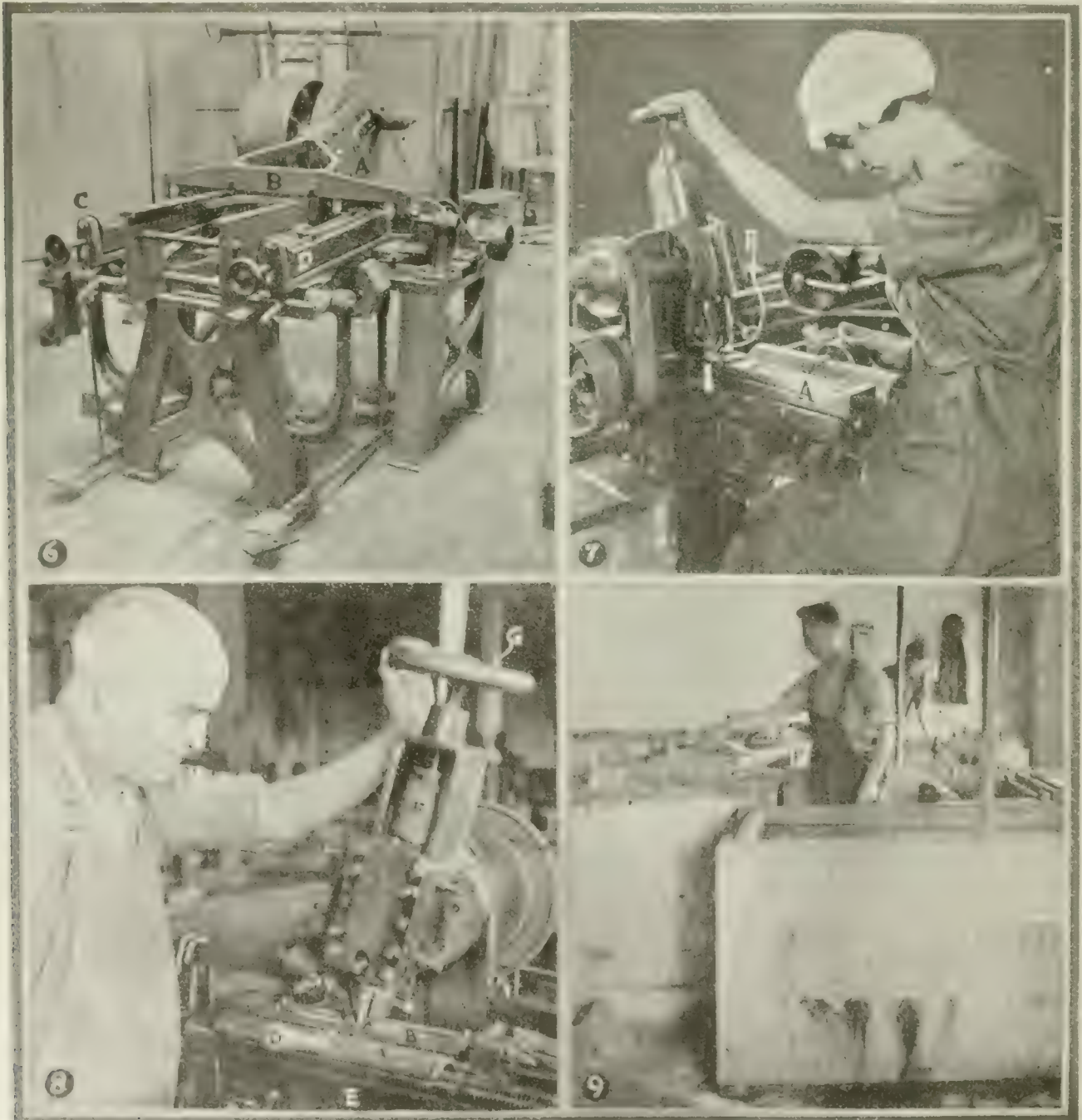


FIG. 6—A STRIPPING MACHINE ALMOST COMPLETED.  
FIG. 7—CUTTING THE SMALLER SIZES OF FILES.

FIG. 8—CUTTING THE LARGE SIZE FILES.  
FIG. 9—TEMPERING THE FILES.



what like the shape of a figure C. He next took another file of similar heat, dipped it into the brine apparently the same way, but the file came out straight as a die. More careful inspection proved that the worker gets so accustomed to the appearance of the blank as it leaves the lead bath that he knows just how to draw it through the brine to make it come out perfectly straight. In other words, tempering is not by any means learned in a day.

The files are now sand-blasted, as shown at Fig. 10. Readers will note the compact arrangement of this sand-blast chute. It is placed centrally on the hardening room floor, takes up little space and allows three workmen to work at the same time. Sandblasting being a process very well known, we will make no comment, except to say that this operation thoroughly cleans the files and removes all paste which may be still in the teeth.

Last, but not least, the files now go to the testing department, where a hardened prover is run over every file. These tools are named provers, because that is actually what they do—prove whether the file will stand up to the work. The provers are much harder than any steel which a file is likely to be used on.

The tester can easily tell if a file is not of sufficient hardness, for the prover will run over, and not grip on the teeth as it should. Every file must stand this test before passing inspection.

Now comes the actual packing and shipping. The files are wrapped carefully and packed in suitable sized boxes, then shipped in the regulation manner.

We have travelled the road from the blank to the finished product, so let us consider a few points of interest in this firm itself.

First and foremost, they believe in supplying the workers with a well lighted factory, and have done so to the limit, even to painting certain portions of the windows to prevent sun glare. All aisles are kept clear, and the plant in its entirety presents a very neat appearance. They employ from 80 to 90, and have a plant covering 90,000 square feet. Every year they turn out around a million and a half of files. Some imposing figure for 90 employees? They have in their employ certain men who have been in the file-making business from twenty years up. The writer made arrangements with the manager, Mr. Swallow, to interview one of the oldest of these men, with the result that we are able as a sort of conclusion, to mention this old-timer's views on the subject of files.

#### Files Then and Now

This gentleman, whose name is Gideon Nantel, has been with the file business for over forty years. He was good enough to relate his experiences, which we had best mention as he told them to us.

"I suppose you realize we had no machines in those days, but cut files by hand," he started. I nodded, and he went on.

"In those days we had no such things



FIG. 10—THE SAND-BLASTING OPERATION.

as oil furnaces, and used to do our forging with the aid of a sledge and open fire. When it came to grinding, we did this all by hand. All our draw filing, or stripping as it is called, was also hand work. To cut files in those days was some job. Have you ever seen a set of old-time file cutting tools?" he suddenly enquired, and on our replying in the negative, off he went and brought back the instruments of torture shown at Fig. 11. I call these instruments of torture advisedly, as you will soon learn.

"Well, now," Mr. Nantel continued, "cutting files in those days was a tiresome task. The small hammer A was used for the smaller sized files, and the small cutter B was what cut them. You held the chisel B on the blank, brought down the hammer with the proper force, then up and down until the file was completed, moving the chisel a little bit along each time.

"Of course it took considerable prac-

tice before you could work with any speed to speak of, and besides it often happened that you slipped and hit your hand instead of your chisel." (N.B.—Editor's note) We agree that this is quite possible, in fact more probable than otherwise for hitting a chisel with such a narrow head is to our idea some job.

"What was the young sledge C used for?" we asked. "That's not a heavy hammer," was the answer, "it only weighs 5 pounds; we had them as heavy as 10 pounds for certain sizes of files." "But what about your wrist?" we asked. "Oh, you didn't work it that way," was the reply. "You notice the peculiar shape and how the nose takes a sudden curve, well, you used it in this way. First you sat directly over your work, held the chisel D in proper position, and brought the hammer C down, more like a drop hammer than as an ordinary hammer. In other words, you used a straight up and down motion. Of course I will ad-

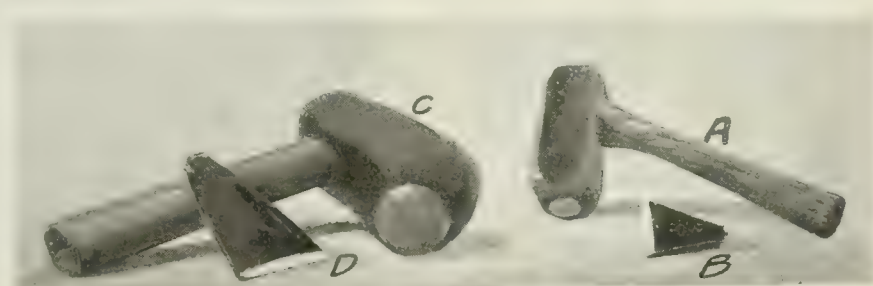


FIG. 11—HERE WE SEE THE OLD TIME HAMMERS AND CUTTING CHISELS.



mit your arms were a wee bit tired at the end of the day."

"What production did you obtain?" we asked. "Each man turned out two and a half dozen a day," he replied. "And by the modern method you turn out?" "30 to 40 dozen," was the answer. "Some difference," we replied, and he agreed with us. On the smaller sizes of files up to 120 inches, the difference was by a skilled operator. So here is still greater production difference.

"There were thirteen to the dozen in those days," commented Mr. Nantel; "the extra one paid the manufacturer for the scrap. I guess that was the idea; it's the only one I know of. Our annealing was done in wood fires, and our hardening in charcoal. Twelve hours was employed in annealing, and thirty-six hours in cooling. The hammers I have shown you are over forty years old," finished the old-timer in this very interesting industry.

An article of this nature would hardly be complete without a final word on the care of the file. We have tried to show that a file is as much a fine tool as any other cutting tool, and therefore should be taken care of. In conjunction with this article we show in panel form a set of suggestions which this firm has

#### A FILE IS A FINE TOOL

The point of each tooth on it is as beautifully sharp as the edge of a good chisel. If carelessly handled, some of these teeth are broken, with the result that the next time the file is used it seems dull and makes furrows or ridges in the work.

DON'T throw files carelessly into the drawer with cold chisels, hammers, etc.

DON'T leave files lying around on the bench or lathe where they are liable to be swept on to the floor and broken. Hardened steel is necessarily brittle, and we take a pride in making our product as highly tempered as we know how.

DON'T keep files in a damp place. Rust will ruin the best tooth ever cut on a file.

DON'T use a file for any other job than that for which it was made. Because it is "Only a File" is no reason why it should be made the "Handy Man" of the shop.

May we suggest that you provide a rack for your files as you do for your drills, etc., so that they may be properly stored when not in use?

If these suggestions are acted on, we think you will find the life of your files materially lengthened, and that they will keep their cutting edge; in which case you will be better satisfied as users and we as producers.

ALWAYS REMEMBER, A FILE IS A FINE TOOL.

INGERSOLL FILE COMPANY, LIMITED, INGERSOLL, ONTARIO

issued and sends out with its product. These suggestions are well worth keeping and paying attention to, so, with the

suggestion that readers study this panel carefully, we close by stating once more: "Remember the File is a Fine Tool."

## Speeding Up Machine Tools With Compressed Air

Production Depends Largely on What Facilities You Have for Handling Your Product. Herein is Discussed How the Work Can be Accelerated by Means of Compressed Air

By F. A. McLEAN

**Q**UANTITY production on an efficient basis is largely dependent on the facilities provided for handling the product during the course of manufacture and in order that maximum production be maintained it is necessary to make the physical requirements called for on the part of the operator as light as possible. When this is done a workman should be able to accomplish practically the same amount of work towards the close of the day as in the beginning. If this is not done, no matter how strong the man may be, he is bound to feel the strain from his continual exertion, and his efficiency and value to his employer is lowered as the day advances.

Any arrangement which will minimize this fatigue on the part of the worker is worthy of attention from the standpoint of higher efficiency, as the conservation of physical energy so often spent in non-productive labor is of primary importance. Aside from the process of moving the work to and from the machine, the operation of the latter generally calls for considerable exertion on the part of the worker, especially in the case of heavy machine tools. This is in time bound to affect his ability to maintain a uniform output throughout the day.

One of the most flagrant offenders in this respect is the ordinary lathe, especially in the larger sizes, which re-

quire the expenditure of considerable energy in backing off the carriage after a cut has been made. In the case of quantity production, this often consumes a larger amount of time and labor which could be more profitably applied in other ways. Many of the more progressive manufacturers who realized this fact have applied a direct lift air hoist cylinder to the task with a view to relieving the operator and speeding up the output from the tool. During the war devices of this nature were quite a com-

mon sight in the large munitions plants of the United States and Canada, but with the close of the shell contracts, many of these contrivances have gone to the scrap heap, which is unfortunate, as many shops could apply them to the manufacture of their regular products with excellent results.

An arrangement of this kind applied to a 24 in. x 20 ft. lathe used for drilling holes in submarine drill pistons in the plant of the Canadian Ingersoll-Rand Company, Limited, Sherbrooke, Quebec.



VIEW FROM TAILSTOCK END OF LATHE SHOWING METHOD OF SUPPORTING AIR HOIST CYLINDER AND THREE WAY VALVE



is shown in figures one and two. From an examination of these illustrations it will be seen that the air motor cylinder, which is 4 in. in diameter by 4 feet long, is placed between the shears of the lathe and supported at each end by rectangular pieces of steel which are re-secured to the lathe bed by tightening four bolts. A hole is bored in the top of the lathe carriage into which is fitted the end of the hoist piston rod, from which the hook has been removed. Lock nuts prevent the rod from shifting.

This arrangement allows the cylinder to be moved to the most convenient point on the bed, or even removed altogether and applied to another machine in a few minutes, if desired.

The hoist cylinder is of the double acting type and is controlled by a very simple three-way valve located within convenient reach of the operator. Pushing the handle of this valve to the left causes the carriage to travel towards the headstock and vice versa, while moving it to a central position cuts off the air supply and allows the air in the cylinder to exhaust.

A three-way valve is placed between this three-way valve and the supply line to take the steam off the three-way valve when the device is not in use. It is perhaps of interest to note that the pistons worked on this lathe are used in the largest water tube tank drills ever made in Canada.

These submarine drill pistons are about five feet long and to drill a small hole through them from end to end with a twist drill is quite a nice job. It was accomplished with little or no trouble by the lathe illustrated. The drill was held in a fixture bolted to the carriage and a stream of cutting compound under pressure was used to keep the drill cool and wash out the chips.

Some of the more modern multiple spindle drill presses are provided with means for raising as well as lowering the head by power, but in many shops there are machines in use which do not have this feature, and when these are of large size it is very tiresome for the operator to have to raise the heads by hand. A simple way of using compress-

ed air to do this work, which has proved very satisfactory, is illustrated in figure 3, and consists of a small and compact direct lift hoist attached to the top of the drill press by a cast iron bracket. The lower end of the piston rod is screwed into a hole bored in the top of the saddle or head of the machine. Supply pipes run from the upper and lower ends of the hoist cylinder and extend to conform to the contour of the machine and terminate in an adjustable valve or speed box located near the foot and hand controls of the drill. With a drill press fitted up in this way it is possible for an apprentice boy to turn out a larger production than a fully grown man could when moving the drill head by hand.

A minister living in "a country district" of the Hawaiian Islands had great difficulty in making his parishioners feel they were properly married until he devised the following service:

To the man: "You savvy this woman?"

"Yes."

"You likee?"

"Yes."

"By and by you no kick out?"

"No."

To the woman: "You savvy this man?"

"Yes."

"You likee?"

"Yes."

"By and by you no kick out?"

"No."

"Pau idonee. Let us pray."—San Francisco Chronicle.

## Sad, But True

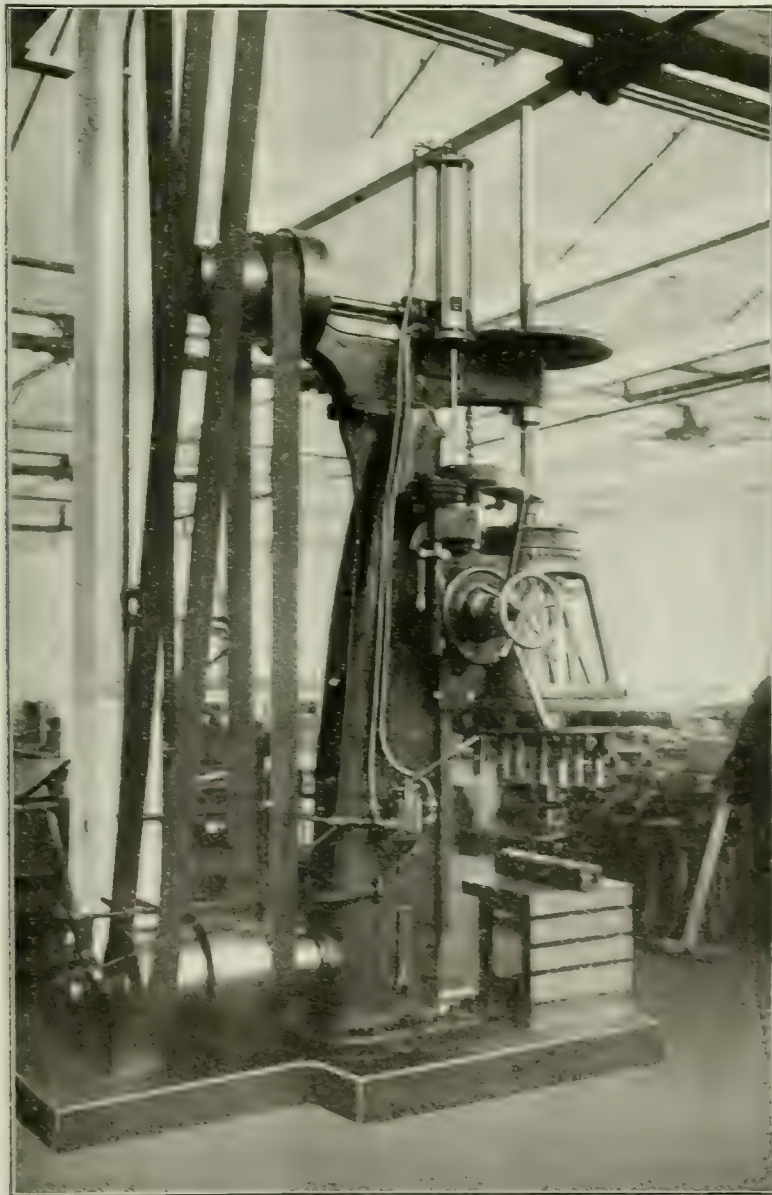
There was a man who fancied  
That by driving good and fast  
He'd get his car across the track  
Before the train came past.  
He'd miss the engine by an inch,  
And make the train hands sore.  
There was a man who fancied this  
There isn't any more.

There was a wise old trainman,  
Expert at coupling cars,  
He used his feet to push in place  
The knuckles and drawbars.  
He did it thus for many years,  
And thought it was great fun;  
He had two feet to push them with,  
He now has only one.

Bill Jones on the repair track,  
Imagined he could do  
A woman's work himself a car  
Without the aid of two.  
Well, yes, he did it many times,  
In shops and yards and waysides,  
One day he was he bumped the car  
Back with his head in the siding.

Between the rails of the northward  
track  
Mike, smug, had one of them.  
An old woman came freight south.  
She sat down on her box.  
There's four feet steps to climb both  
tracks.

These steps Mike did not take,  
Then Number 1 approaching straight,  
Result: "An Irish Wake."



RAISING AND LOWERING HEAD OF SPINDLE DRILL

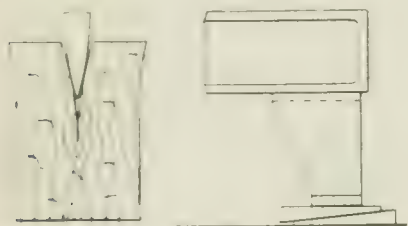


# Shop Arithmetic, Inclined Plane, Wedge, Screw

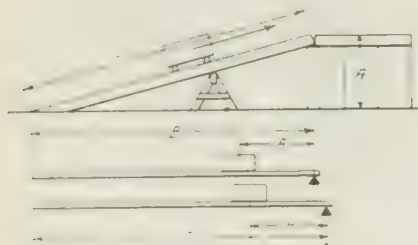
Thirteenth of a Series in Practical Mathematics for the Mechanic and Those Learning the Machinist Trade—The Present Article Takes Up Some Problems in the Three Above Subjects Mentioned

By J. H. RODGERS

**C**LOSELY associated to problems involving the practical application of the simple and compound lever, is the inclined plane (wedge) and screw, examples of which are to be seen in everyday shop practice. As the name implies, the inclined plane is a surface that is inclined at an angle to the horizontal, and while this definition specially refers to inclined surfaces in general, the theory and the calculations, in some respects, are identical to the wedge and the screw principle. The most simple form of the wedge may be seen in the splitting of wood, in the alignment of machine tools, or other heavy objects.



The theory of the work performed by means of the wedge is quite similar to that of the block and tackle, and is merely the energy that is required to raise the weight in the vertical direction, plus that necessary to overcome friction. Suppose a large case is to be skidded up an incline of 30 degrees on to a truck or platform, the work performed would be the same as if the weight were raised vertically, although the object had been moved through a greater distance. The action may be compared in some respects to that of a lever where the force applied is less than the weight raised, but moving through a greater distance. This will be more clear by referring to the following sketch:



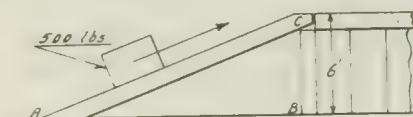
From this it will be seen that the mechanical advantage is increased by decreasing the angle of the inclined plane. In moving a weight up an incline there are three distinct methods that may be followed, namely: when the force applied acts parallel to the inclined plane; where the force acts parallel to the horizontal plane; and where the force is ap-

plied at a constantly changing angle, as shown in the sketches A, B, and C.



As the third case involves the use of advanced arithmetic, it will be dealt with later on, so that we can confine our present calculations to the first two cases. A little thought will show that the first method will be the most efficient as the mechanical advantage is greater. The force applied acts through a distance equal to the length of the inclined plane, and from the rules previously given for such work the power multiplied by the distance through which it moves, will equal the weight multiplied by the vertical distance through which it is raised.

For the above case, suppose a weight of 500 pounds is raised to a platform 6 feet above the floor using a skid at an angle of 25 degrees, what force would be required, figuring the power necessary to overcome friction at 25 per cent?



With an angle of 25 degrees and a raise of 6 feet, the length of the incline would equal the hypotenuse of the right triangle A B C. In order to find this length we must use the principle of trigonometry, as outlined in the ninth lesson. The rule would be:

$$\text{Hypot} = \frac{\text{Side Opp}}{\text{Sine}} = \frac{6}{.42262} = 14.2'$$

To find the power required, use the rule as stated above, which as a formula would be:

$$P \times A C = W \times B C \quad \text{or} \\ P = \frac{W \times B C}{A C} = \frac{500 \times 6}{14.2} = 211 \text{ lbs}$$

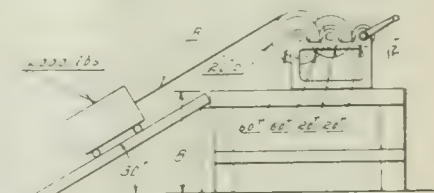
With 25 pounds necessary to overcome friction, the total force required would equal  $211 + 25 = 236$  pounds.

If, on the other hand, the power had been applied in a direction parallel to the ground, or horizontally, the force would have acted through a distance equal to the base of the triangle. This distance and the resultant force required to advance the weight up the incline, would be as follows:

$$\begin{aligned} \text{Side Adj.} &= \text{Cotan} \times \text{Side Opp.} \quad \text{or} \\ \text{Base A B} &= 2.1445 \times 6 = 12.867 \text{ feet} \\ \text{Then } P \times 12.87 &= 500 \times 6 \quad \text{or} \\ P &= \frac{500 \times 6}{12.87} = 233 \text{ lbs} \\ 233 + 25 &= 258 \text{ lbs} \end{aligned}$$

as the total power necessary.

In the two examples given above, the force required was practically one-half of the weight being raised, so that for heavy weights some mechanical combination would be adopted to increase the mechanical advantage. This could be done as shown in the last lesson, or a small windlass could be utilized for the purpose. In the sketch below, what power would be required to move the weight of 2,000 pounds up the incline, friction being neglected?



The length of the inclined plane would be:

$$\text{Hypot} = \frac{\text{Side Opp}}{\text{Sine}} = \frac{16}{.5} = 32 \text{ feet}$$

The tension in the rope R would then be:

$$P = \frac{2000 \times 16}{32} = 1000 \text{ lbs}$$

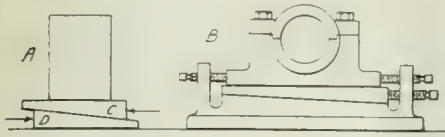
The advantage in the windlass is in the compound arrangement of the gearing, and to find the power required on the hand lever, we proceed on the basis that the power applied, multiplied by the length of the power arms, equals the weight times the weight arms, so the solutions of the above would be as follows:

$$\begin{aligned} P \times 24 &= 1000 \times 24 \quad \text{or} \\ P &= \frac{1000 \times 24}{24} = 1000 \text{ lbs} \end{aligned}$$

An application of the wedge that will be recognized as frequent shop practice, is shown below at A. The force applied may take one of several forms. Ham-



mers or sledges may be used, or common jacks used to provide the necessary power to raise the weight. The same principle is adopted in the pillow block shown at B, and here it is used more for adjustment to position than for weight raising.



Suppose in the case A, the wedges had a taper of one inch per foot, and the weight of 1,500 pounds had to be raised half an inch, what power would be required to be exerted on the wedge C, and what distance would it have to move, the wedge D remaining stationary? With a taper of one inch to the foot, the wedge C would have to move forward 12 divided by .5, equals 6 inches. If the force is applied in a horizontal direction the power would be:

$$P = \frac{W \times .5}{6} = \frac{1500 \times .5}{6} = 125 \text{ lbs}$$

In the case of the pillow block shown at B, the centre line of the bearing has to be raised 1-32 of an inch and moved 1/8 of an inch to the left; how many turns would be required on the adjusting bolts if the pitch was 1-10th of an inch for the lower adjusting, and 1-12th of an inch for the upper locking screws, the taper of the wedge being 1/4 of an inch per foot?

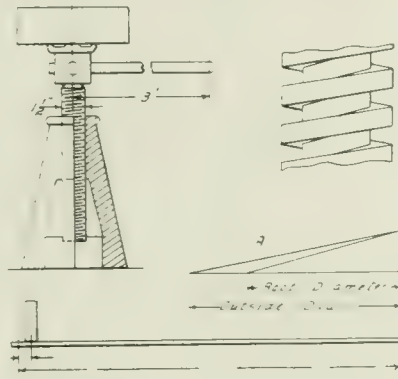
With a taper of 1/4 inch per foot the movement of the wedge for a 1-32 inch lift would be:

$$\frac{1}{4} : \frac{1}{32} = 12 : x \quad \text{or} \\ x = \frac{12}{1} \times \frac{1}{32} \times \frac{4}{1} = \frac{3}{2} = 1\frac{1}{2} \text{ inches}$$

With a pitch of 1-10 inch the adjusting screw would be given 1.5 x 10, equals 15 turns. The lateral or side movement of 1/8 inch would require:

$$\frac{1}{8} : \frac{1}{12} \quad \text{or} \quad \frac{1}{8} \times \frac{12}{1} = 1\frac{1}{2} \text{ turns}$$

What might be classed as a continuous wedge or inclined plane is illustrated in the sketch of the screw-jack herewith:



Suppose the screw has 6 threads per inch and the lever is 3 feet long, what

pressure would have to be used to raise a weight of 2 tons, friction being neglected? The angle of the inclined plane formed by the screw would be found by calculating the circumference and by "trig."; the development of one turn is shown at A, and at B is seen an enlarged section of the thread. By referring to the sketch A it will be seen that the angle of advance in a screw thread is not uniform owing to the difference in the diameter between the outside and the root. When calculations are made in connection with screws, the angle adopted will depend on the prevailing conditions, but in general, the use of a mean would serve most purposes.

The screw-jack problem, simplified, is shown in the lever diagram at C, and the solution would be:

$$P = \frac{2000 \times 6}{36} = \frac{4000 \times 6}{36 \times 6} = 18.5 \text{ lbs.}$$

One day, many years ago, the telephone in the office of the chief of police rang. Chief Speers answered. The call was from a new policeman on the Union Avenue beat. He said:

"A mon has been robbed down here, and I've got one of them!"

"Which one have you?" asked the chief.

The reply came back; "The mon that was robbed!"

## Does the Crane Receive Consideration it Deserves

A Paper Delivered Before the Metals Section of the Eighth Annual Safety Congress of the National Safety Council at Cleveland, Ohio, Under the Heading of "Consider the Crane"

By CHESTER C. RAUSCH, Assistant Director, Safety Institute of America, New York City

EVER since Noah handled lumber while constructing the Ark, and the Egyptians stones while building the Pyramids, the problem of handling material has been present in industrial work of whatever sort or kind. It is not improbable that one of the earliest methods of handling material was by the use of some form of rope manufactured of hide or woven barks passed over the limb of a tree. Later some means was found to use parts of trees that had been blown over, or that had in some way been felled, to construct the simpler forms of derricks. As we know them to-day, derricks and cranes are the result of a development extending through centuries and representing the solution of many problems one after another. Of late years various forms of power have placed at the disposal of man a ready means for adapting his machines to types of work that were formerly done by the laborious efforts of man and beast.

In no particular field has greater de-

velopment been made than in that of handling and conveying materials in connection with the processes of construction, manufacture, and transportation. More recently the fact that electric current furnishes such a flexible source of power has greatly accelerated this development and in the past decade the enormous increase in the use of steel and iron for the fabrication of structures and objects formerly made of wood has called for a further development of machinery to handle the greater unit weights involved. During the last three or four years particularly the production of cranes of all sorts has increased unbelievably and not only is their lifting capacity greater but their flexibility of operation and their safety of manipulation as well. Where we formerly saw a braced pole derrick superseding a single stick or gin-pole, we now find locomotive cranes, tower derricks, overhead travelling cranes, gantry cranes, floating derricks, wall cranes, gib cranes, and a variety of combinations of these

devices that enable almost any conditions where material must be handled to be met by the selection of a type of crane to do the work and that will, at the same time, consume the least power, offer the greatest flexibility, and afford the greatest safety during operation.

During the last ten years the writer has had opportunity to observe the operation of cranes of all types used in manufacturing processes and in construction work, as well as in those fields that generally are considered under the head of transportation. In spite of the developments that have been made, both from the point of efficiency and safety, there appear to be still a large number of hazards that are reproduced repeatedly in the construction of later models or that result from the manner of their installation or the method of using them. It is to call attention to some of these points and to offer some suggestions by which these recurring hazards may be eliminated that the present paper is prepared.



The locomotive crane is coming to be one of the most common types in use, both in shops and in yards. Unlike the overhead travelling crane, it is not confined to definite limits of operation within a building or over a given yard space but, because of its mobility, it operates equally well within a shop or about a yard. This flexibility of operation considerably eliminates the number of times that a piece of equipment must be handled when it is taken from one location to another. Moreover, the boom forming part of its construction enables it to reach places an overhead crane could not approach. This one feature, probably more than any other, has brought about its introduction in many plants to perform a great variety of work formerly done with the use of rollers, skids, and various sorts of lifting tackle. The locomotive crane is a rather recent development, and while its hazards are more or less obvious, there are not as many men available who are skilful in handling this type of crane as there are of other types. The greater skill required in their operation, and their mobility, has resulted in a greater number of accidents from their use.

One of the main sources of hazard consists in the failure to keep the road-bed over which the crane must travel in the best condition. Frequently, in an effort at economy, light weight or partly decayed sleepers and second-hand, defective, or light rails have been used, resulting in an inconvenient and unsafe road-bed. The failure to keep the road-bed properly tamped and drained allows it to settle and become uneven, so that the crane does not travel steadily and is far more liable to overturn. The use of improper frogs, cross-overs and switches, and the failure to keep them in repair, increase this hazard. Such a road-bed throws numerous strains into the structure of a moving crane by the swinging motion imparted to the load suspended from the boom. This condition sometimes becomes aggravated to a point where collision of the suspended objects may occur with other railroad property or with structures in the yards adjacent to the track upon which the crane travels. This distracts the engineer's attention so that collisions with pedestrians, trucks and teams are more apt to occur.

When locomotive crane track-ways are placed too near buildings, especially on curves, the entire attention of the engineer is often required to prevent collision with buildings, and in cranes that are capable of considerable speed of movement damage is frequent. Where the crane is large, both in lifting capacity and range of boom and the engineer's eye is located some distance above the ground, this hazard is particularly serious. The writer recalls a case where a travelling derrick locomotive crane could pass a building only by being tipped on its table at the same time it was moving along on a section of a curve. The crane of a building almost beside the crane was entirely demolished and a considerable portion of the roof was pulled by being struck by the frame. Another time, while making this turn,

the engineer was giving his entire attention to avoid collision with the building and failed to notice an automobile truck standing close to the rails. On a straight track it would have cleared the truck, but caused a collision because the crane was turning on its table. The crane, which had considerable power of locomotion, forced the truck against the side of the building, demolishing its entire front end.

Overturnings are frequent with locomotive cranes. In the smaller sizes the wheel base is extremely short, and in many cases the boom is swung with loads beyond the safe capacity for any increased angle of elevation and the crane is tipped on its side when this angle is increased ever so little as a result of even slight inequalities in the roadbed. Even when travelling on a straight track under these conditions and with the boom axis parallel to the axis of the track, slight obstructions on the rail are sufficient to cause disaster because the crane is working practically at its ultimate lifting capacity, and its point of safe balance. This type of accident occurs in construction work particularly, because the road-bed is nearly always of a temporary nature and poorly laid. Moreover, on such jobs, supervision of crane operators is apt to be less careful and the material handled less standardized in size and weight, so that overloading is easier and more frequent.

Another difficulty is the inability of the operator to maintain a clear view both ahead and behind his crane while travelling. Inability to see toward the rear when the crane is moving forward frequently results in people being injured when his crane is turned on its table and inability to see toward the rear may cause people or objects to be run over when the crane moves in that direction. Reflecting mirrors, similar to those used on automobiles, tend to eliminate this difficulty, provided the mirrors are adjusted carefully and are of sufficient size to afford ample view. In some cranes small windows have been placed low down in the rear of the crane and the storage tanks and coal pockets altered to permit the use of peekholes through which the engineer while standing in his usual place and turning his head can see behind the crane. Even when alarm bells or gongs are used the engineer cannot be certain, without seeing, that an accident is not imminent to material or persons on the track.

Whenever any crane overturns, unusual and frequently very considerable strains are placed on the structure of the crane, particularly the boiler and steam piping which, because of the internal pressure in them are already seriously stressed. Engineers, even if they are fortunate enough to escape scalding or injury when the crane overturns, may be penned in and seriously burned unless the doors and windows on such cranes are arranged to open outward and are provided with fasteners operating from both the inside and the outside.

Many times the original structure of the crane, particularly the boom, has been changed; lengthened to increase its

range, strengthened to increase its capacity for lifting. Any lengthening of the boom immediately reduces the capacity of the crane to handle safely loads at a given elevation, and an increase of the cable size and strength or an increase of the steam pressure to permit the lifting of heavier loads at greater boom elevations introduces strains that frequently cause collapse. The failure of many crane engineers to recognize the tremendous reduction in the safe capacity of the crane due to any change in elevation has resulted in the collapse of many booms. This tendency to lengthen the boom has been greatly increased by a desire to facilitate the placing of work in locations beyond the reach of the boom as originally made. The writer recalls a number of instances where such changes as this have resulted in death to the operator. It is a tendency that most certainly should be corrected.

If the operator of a crane, and particularly of one that has been structurally changed, is given to the performance of spectacular stunts while operating it, the limit of damage is beyond estimate. Speeding the crane along the track, rotating the crane upon its turn-table at such speeds that the load is swung far beyond a point directly below the end of the boom, thus virtually increasing its length in addition to creating a considerable side strain and the dropping of loads from considerable heights and stopping it just before it reaches the ground, are performances which the cranes were not constructed to stand, even considering all factors of safety used in its design. The combination of two or more of these performances at the same time may introduce strains great enough to overturn the crane, to destroy its structure, and to injure not only the crane but many structures adjacent to it. Where the crane is elevated upon a trestle the hazard is greatly increased because strains are sometimes thrown upon such a structure that it cannot safely withstand them. If the crane falls from such a structure it is obvious that the damage is apt to be tremendous. Many operators overload cranes and take a chance that the crane can handle the load. This tendency is fostered by the fact that the crane is never under the observation of a single foreman but moves from place to place in charge of its operator. While such acts are, of course, matters of discipline, there are several devices which have been attached to cranes to indicate when the crane is at the point of overturning and to give audible warning beforehand. The best devices of this sort are placed in the cab of the engineer and are frequently supplemented by an indicator placed on the boom which shows, by means of a pointer, the safe load that may be picked up for any given boom elevation. This indicator may also indicate safe overhead clearances for the boom. The use of the tables of safe boom elevations for given loads frequently placed on plates attached to the frame of the crane or in the cab, cannot be depended upon because they require the exercise of the element of personal es-



timation of conditions upon the part of the operator.

Whenever cranes approach obscure corners of buildings, door openings, or other point from which traffic or individuals may issue, the engineer should be under obligation either to stop the crane or to have it in such control that a collision could occur only under unusual circumstances and then in a manner to cause only minor injuries.

Locomotive cranes are frequently poorly illuminated even when they perform their work in places where the operator has no adequate opportunity to see clearly the work he is doing. The placing of several storage battery cells aboard such a crane provides current for adequate light in the interior of the cab for firing and for illuminating the gauges and particularly for a spot light that can be controlled by the engineer and thrown upon the objects he is handling. Very frequently a light placed on the tip of the boom, and arranged to throw its rays vertically downward, has been found of great advantage. Whenever such cranes work at night, consideration should certainly be given to these points.

The work done by locomotive cranes is nearly always conducted out of doors and little attempt is made to house them or to protect them from the elements. As a result, rust, with all its attendant and subtle hazards, attacks the machine in various places—the cables particularly. Proper painting should be given at frequent intervals, adequate lubrication provided, and the boiler should have regular inspection. Improper feed water may introduce trouble enough to put the crane out of commission.

In the operation of such cranes dependence is frequently placed upon lowering the load and swinging the boom to throw an object upon storage piles or into a location that cannot be reached by the crane when in its ultimate safe position for such a load. The element of time is here depended upon to permit the load to swing into its final place before it can tip the crane far enough to cause it to overturn or leave the rails. Any failure of judgment on the part of the operator is fatal.

Another pernicious tendency is sometimes revealed when the crane is derailed and a leverage action is created by attaching the boom to the track ahead and by the application of power causing it to lift the rear end of the crane so that it may be swung again to the rails. This is done with the boom in an almost horizontal position and has destroyed cranes by introducing the severest strains to which the crane could be subjected. It is obvious that this can only be done where the road-bed is laid in a manner sufficient to permit such a strain. Recognizing this fact and to increase the leverage the operator endeavors to reduce this strain on the track to a minimum by placing the boom in its lowest position. The housing of the hoisting mechanism and the anchorages of the turn-table are very often torn apart in this manner.

Overhead travelling cranes have probably received as much attention at the hands of designing and safety engineers

and inspectors as any other single piece of equipment. This is probably due to the fact that it travels over areas in which are located many workmen and much valuable machinery and material, so that a failure of any part of the crane may bring about disastrous results. A locomotive crane necessarily clears its own way before proceeding so that there is not the same proportion of hazard as in the overhead crane, which may create dangerous conditions over the heads of many men without their knowledge. One common fault is the failure to keep the rails upon which the overhead crane travels in proper line both for lateral and vertical adjustments. A slight settling of the rails or a slight misalignment sideways as a result of strains introduced by wind, settlement of building foundations, overloading of structural framework, etc., frequently causes the tracks to assume an extremely crooked appearance. The writer knows of a case where as much as fourteen inches of settlement occurred and where there was a lateral displacement of nearly eight inches. On this particular crane-way, loads as heavy as twenty tons were being carried, and in order for the crane to navigate at all one rail had been practically freed of all anchorage to its supporting girder, and had even been greased under the flange to permit it to slide sideways and so follow the movements of the crane. Struts, with nuts on the end, held the rails from falling off the girder. The eccentric strains thrown on the frame of the building by this condition and upon the crane, due to a swinging of the load which was thrown out of equilibrium by such movements, was considerable and several serious accidents resulted. Fortunately a change in management furnished an incentive to eliminate these conditions. In another case a crane repeatedly jumped the runway rails at one end until the wheels were found to be of different diameters and so made one end progress farther than the other.

Far too many overhead cranes are used without adequate signs to indicate their safe capacity. The writer recalls a case in which a load, so large that the crane could not lift it, was placed under as much lifting strain as the crane could exert and was then dragged down the length of the shop to its location. Such practices, while they are not frequent, indicate a tendency on the part of the operator to take chances—a tendency probably fostered by his lack of adequate information regarding the capacity of the crane or of the dangers which such treatment introduces.

Wherever the space available in a shop will permit, there should be a free aisle-way from one length of the crane-way to another over which loads may be carried without the necessity of passing over more than a few individuals. There are not many old shops where this is possible, but there should be some portion of the shop specifically kept as free as possible from men and valuable material and machines to permit the crane operator to carry material over such a space without any more hazard than is necessary. When unusual loads are carried over such spaces every in-

dividual should be made to stand from under the load.

There are many excellent installations of the highest quality of cranes operating over inadequately illuminated spaces. The fact that the operator is a considerable distance above the floor where the attachments to the crane hook are being made and that he must see through a haze that sometimes develops in shops from product being manufactured in spite of proper ventilation only aggravates an already bad condition. This atmosphere might be a permanent or only a temporary condition. For example, a foundry is very often badly troubled with this haze during a pour, and a machine shop that may be generally clear will become clouded for a portion of the day as a result of a large babbitting operation done inside the shop or from the wafting of smoke or fumes into the shop from other parts of the building or from out-of-doors. On days when natural illumination varies it sometimes happens that the lights are not turned on during the darker periods so that there are periods of comparatively poor illumination from the crane operator's standpoint. In many shops the artificial illumination is not sufficient to afford adequate vision at any time. It may be far too expensive to increase the general illumination for the benefit of a single crane operator, and in such cases, and even when illumination is good, excellent results have been obtained by attaching to the crane trolley one or more lights properly covered with a focussing reflector, and so arranged that the area immediately about the hook when at its lowest point and near the floor is brightly illuminated. Such illumination tends not only to assist the crane man to observe what is being done on the floor, but helps crane attendant to make proper attachments to the load. Furthermore, when such a load is travelling down the shop, the brilliant illumination throws it into bold relief, and it serves as an admirable warning of its approach. In many shops the hook of the crane is painted white and kept white in order that it shall attract attention to itself and furnish some measure of indication to the crane operator of its location with reference to the floor. Where such a hook is illuminated by overhead lights as just suggested, it is very conspicuous.

In many shops lighting fixtures arranged to furnish general illumination of the floor are, from necessity, placed above the travel way of the crane. If such buildings have wide spans, the crane operator, unless properly shielded by an awning to his cab, is confronted in his view up and down and frequently across the shop with many spots of brilliant and glaring light that serve to confuse his vision. In some shops this general illumination from above the crane-way is augmented by lamps having angle reflectors, and too often no reflectors at all, placed just below the crane runway. When operating the trolley on the far side of the shop these lamps throw a steady stream of light into the face of the operator, seriously confusing his action. Such lamps should be shielded from above with reference to any posi-



tion the load to be observed by the crane operator must assume.

A person making an examination of any considerable number of overhead travelling cranes is impressed by the fact that so many of them have none of the electrical equipment in the cab properly guarded. There are exposed contact points, circuit breakers, knife switches and terminal lugs carrying from 110 to 500 volts or more. Contact with these exposed points may not only kill a crane operator but may temporarily incapacitate him so that his crane continues its motions uncontrolled. The use of the simplest form of shields or guards composed of asbestos, wood, sheet metal or other material are not only easily applied but inexpensive. The possibility of serious accident in the movement of an uncontrolled crane is sufficiently great to require ample protection for the crane man and new equipment should be specified to have only back-connected control panels and inclosed resistance grids.

Many cranes have practically nothing more than a hand rail to keep the operator in the cab. During his slack moments, when he is comfortably stretched on a box, stool or bench, any lapse of consciousness would permit him to shoot under this rail and fall to the floor below. There is no reason why the crane should not be enclosed to a reasonable height with grillage to prevent such an accident and in a manner that need in no way interfere with the crane man's vision or movements.

Cranes, like all other apparatus, require occasional repairs, and continual maintenance. It strikes one as almost criminal to note the lack of any adequate repair deck over which the crane may be housed and from which oiling, adjustments and repairs may be safely performed. There is scarcely a condition in any shop where such a deck cannot be provided in one end or the other for at least a portion of the width of the crane span. Although there are many heavy parts used in the construction of the trolley of a crane, no provision is made for a small wall crane or a travelling chain hoist to assist in this work. Many times repair men are exposed to serious hazards from falling on account of this lack. It is not infrequently the case that the bottom chords of the roof trusses are used in making repairs and at such times they are subjected to strains which they were never designed to withstand. Workmen are frequently called upon to make crane repairs after dark and to use electric drills or soldering irons in connection with their work. The placing of a few plug receptacles for the attachment of portable extensions to make connections to these tools would greatly assist in this work. Such provisions should be made as parts of a repair deck.

Most cranes are not fitted with an over hoist or over travel stop that automatically arrests the upward travel of the hook and its load if the operator fails to disconnect the power of the hoisting motor as the hook-block approaches the hoisting drum. On large cranes that handle heavy loads the hook travel upward is slow and in many cases the part being hoisted requires a maxi-

mum upward travel of the hook. Crane operators have been observed to turn on the power and calmly wait for the load to come into contact with the over travel release, thus disconnecting the motor. The fallacy and danger of such operations are evident and should be matters of strict discipline.

Every crane requires its cable to be lubricated to prevent wear from friction and destruction from rust. While such lubrication accumulates grit and dirt in some shops the advantages of the lubrication tending to give long life to the cable more than offset the damage which this grit may do. The lubrication of the cables is sometimes accomplished by a man standing on the trolley who applies the grease as the cable is wound up. Sometimes the cable is all wound up and the top half of the drum properly greased. The bottom half is then greased after the drum has made a half revolution to bring the ungreased cable into an upward position. The writer recently saw a very clever greasing device which could be temporarily attached to the top of the hoisting block in such a way that an arm holding collar made of soft wicking could project out and surround the cable. This arm was connected with a tank supplying grease in such a way that the cable, by passing through the collar, became properly lubricated throughout its entire length.

In view of the present knowledge concerning crane operation it seems rather trite to mention the fact that so many cranes are operated without a safe or convenient means of access to their cabs. The daily exposure of operators to falling, to contact with live wires, or to being overcome by fumes or gases while climbing to their cabs is considerable. It would seem the part of wisdom that not only new structures, but old structures as well, should be equipped with either a properly enclosed ladder or an adequate stairway from which the cab could be reached with a minimum of risk.

Overhead travelling cranes, and locomotive cranes to an increasing extent, are handling material by means of electro-magnetic lifting devices. These are so ruggedly constructed that they will withstand almost unlimited abuse. The only weak link in their safe operation is the cable connecting them to the source of power or the power supply itself. Usually the power is sufficiently reliable to make failure only a remote possibility. The cable, however, is subjected to all manner of rough handling as a result of following the movements of the magnet and from its contact with the ground, material being handled and, sometimes, with the devices that are used to keep the slack of this cable from fouling itself with the boom. One of the best solutions of this difficulty has been the adoption of a cable which can follow the magnet in the same manner that the lifting cable follows it. If this cable passes over a suitably grooved pulley at the tip of the boom, or on the trolley drum of the crane, and is so arranged that a counterweight will carry the slack down the boom or that it will wind up on the drum of the trolley most

of the wear can be avoided. Suitable electrical connections can be made by means of contact with a sliding bar or with a rotary collector ring on the trolley winding drum. A proper application of this device will result in longer life to the cable and avoid all damage due to kinks, cuts, abrasions and strain.

One may still find a tendency to overload crane hooks. While the hazards created by the improper use of chains is well known, and may result in careful handling of them on the part of well-informed operators, there are still a considerable number of floor men who introduce strains in crane hooks which it is impossible for them to stand without serious deformation or breaking. In handling some objects, several chains are used, so that the mouth of the hook is filled and attachments are made to the very tip of the hook in such a way that a severe side bending strain is introduced in addition to the lifting strains introduced by the chains hanging at the bottom of the hook.

The inconvenience attendant upon work performed on overhead cranes and the failure to provide convenient platforms from which to perform such work, has resulted in much neglect of crane repair and upkeep. One of the most noticeable defects is an increase in the amount of play and back-lash that is allowed to develop in all parts of the structure, particularly in the gears. When this is excessive and the gears pound badly, the starting of the motor or its reversal from a raising to a lowering motion introduces strains on pinions, shafts, keys, and other parts sufficient to cause much damage. This wear is very often due to the fact that adequate lubrication has not been furnished because access to the oil and grease cups has been difficult and the person responsible for maintaining the equipment has neglected to do his work because of the difficulty of getting at the places where it must be performed. In some cases this condition has been helped materially, and even overcome by the use of oil cups or compression grease cups serving all parts of the crane and so located that they can all be reached from the crane walkway. It then becomes necessary only to go with an adequate amount of grease or oil to the several conveniently located cups to keep bearings adequately lubricated.

Gantry cranes, wall cranes, and other combinations of hoisting apparatus capable of operation in one or more directions, each has its particular problems, but they have been covered by consideration of similar conditions that occur largely in both locomotive and overhead travelling cranes. There is probably no piece of apparatus that does more to facilitate easy and convenient work than do these various types of cranes, and it seems strange when one considers that so much has already been done to make them safe, that there still remain so many obviously dangerous points at which they could be improved, not only to facilitate their speed of operation but to reduce materially the hazard to the operator himself and to those adjacent to the movements of such cranes.



# A New and Novel Quick-Action Gripping Hook

Readers Have no Doubt Heard the Old Joke About the Sky Hook,  
Which You Hitch on to a Passing Cloud. Well, This Isn't a Sky  
Hook, But You Attach it Almost Anywhere

By J. H. M.

**I**N commencing this article let it be understood that the author merely presents before readers of CANADIAN MACHINERY a new feature which is useful to shop or garage.

The views accompanying this article were taken in a garage simply because it was not convenient to photograph them elsewhere. We would have preferred these views to show some machine tool plant, but we can at least repeat what the inventor of this novel gripping hook told CANADIAN MACHINERY'S representative.

This procedure takes considerable time. It is in such cases that this hook is used. It will grip on any beam from  $1\frac{1}{2}$  inches wide up to 6 inches. The jaws are 5 inches long by 2 inches wide, making a total gripping surface of 20 square inches.

The heavier the weight the tighter the jaws grip. The chief feature is the speed in which it can be placed in position. The user merely pulls the hook open by hand, places over the beam, lets the jaws grip naturally, after which attach block and tackle to the lower ring as shown in photo.

At Fig. 2 we show one of these one-ton blocks raising the forward part of a Packard car from the floor. There is approximately one and a half tons on the

hook which is shown in the illustration.

The main use for such attachment is claimed to be in the hanging of shafting for lifting heavy work on the lathes, planer, or other machine tools; in fact for around shop purposes.

The inventors, the Patterson Brothers, of Hamilton, Canada, have patented this hook in both Canada and the United States, and are quite optimistic as to its future possibilities.

Village Constable (to villager who has been knocked down by passing motor-cyclist): You didn't see the number, but could you swear to the man?

Villager: I did, but I don't think e' 'eard me.—Galveston News.



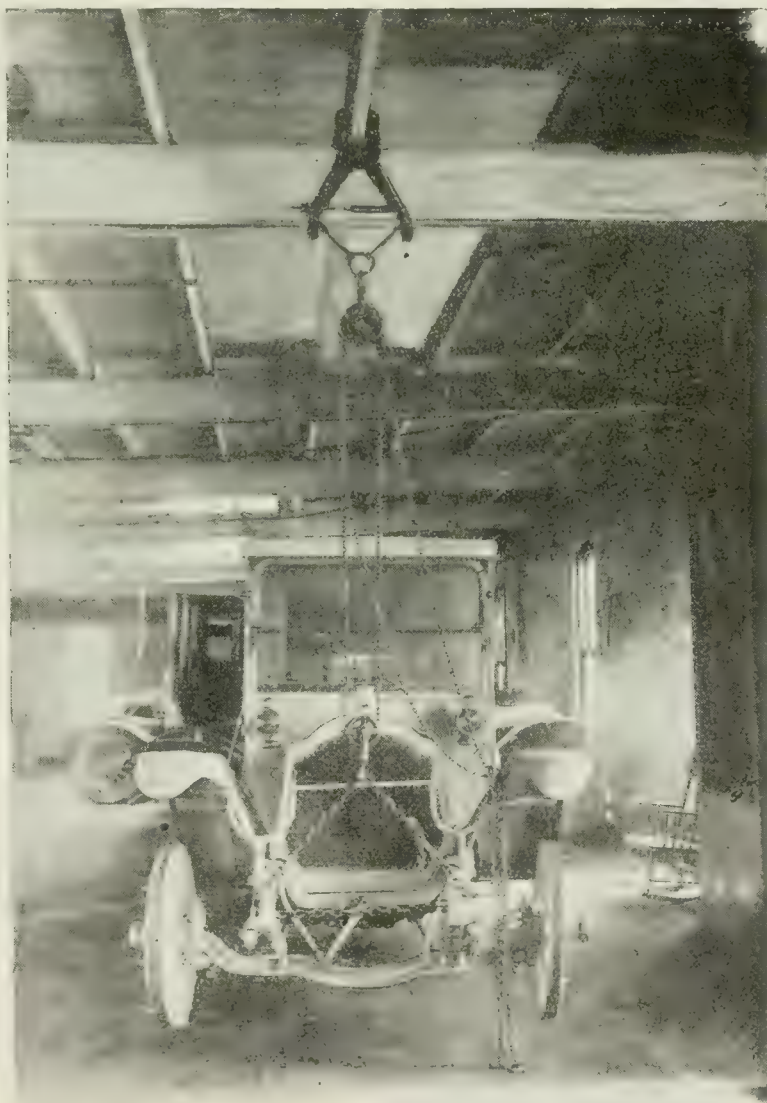
A DETAIL VIEW OF THE HOOK.

The principle of the idea lies somewhat along the lines of a pair of ice tongs. Fig. 1 shows the grip hook itself, with a piece of timber between the jaws for illustrative purposes.

These hooks are to be made in all sizes up to at least three-ton capacity. The range will be in all probability 1 ton, 2 ton, and 3 ton capacities. So far only the 1 ton size is on the market.

Each jaw is complete in itself, and is made of malleable iron. The two links and ring for the tackle to hook to are made of steel rod welded.

Every grip is tested beyond its capacity before being passed. The advantages of a hook of this nature are claimed to be as follows: On a ceiling with no space between the beams and ceiling it is a difficult matter to attach lifting tackle without first drilling a hole through the beam, placing a stout bolt through this hole and attaching tackle to the bolt.



GENERAL VIEW, SHOWING THE HOOK IN USE. THE HOOK IS NOW LIFTING APPROXIMATELY  $1\frac{1}{2}$  TONS.



# Canadian Machinery Drafting Course—Part V

Geometrical Terms and Meanings With Figures Illustrating Same  
—Various Kinds of Triangles and Quadrilaterals Defined—Six  
More Problems Given Together With Explanatory Data—Fifth  
Plate of the Course

By J. H. MOORE, Associate Editor Canadian Machinery

**I**N the previous instalment on this very necessary subject we defined certain definitions, up to the point of the obtuse angle, stopping at the aforementioned angle in order to proceed with plate No. 4.

We will now go further into the subject of geometrical terms and their meanings.

Leaving the angles we next come to the subject of surfaces, which prompts the enquiry, "What is a surface?"

A surface is produced by the motion of any line. It always has two dimensions, namely length and breadth.

There is another type of figure termed the plane figure. This could be explained as follows:

A plane figure bounded on all sides by lines (that is, taking it for granted that they are straight lines) is called a polygon, or as sometimes termed, a rectilinear figure.

So now, since we've come to polygons, let us see what various types we find.

A polygon proper is a plane figure which is bounded on all sides by straight lines, these lines being called sides, and the sum of these sides being termed the perimeter, which means the length of the boundary.

These polygons are classed according to the number of sides they have and are as follows:

A triangle is a polygon with three sides; a quadrilateral is a polygon with four sides; a pentagon, with five; a hexagon, with six; a heptagon, with seven; an octagon with eight; a decagon, with ten; a dodecagon, with twelve; an equilateral is a polygon whose sides are all equal. A regular polygon is one all of whose angles and sides are equal.

These definitions describe in full the various type of plane figure met with in geometrical problems, in fact some of those mentioned in the list very seldom appear, but for the student's benefit have been spoken of in order that he may familiarize himself with the names.

Now polygons again can be classified into various headings, in fact such is necessary, so briefly we will proceed to define some of these general headings.

First we come to triangles, namely the polygon, with three sides. The angles of a triangle are of course the angles formed by these sides. Figs. 1 to 6 illustrate the different type of triangles met with. At Fig. 1 we see the right angled triangle, or, as it is commonly termed, the right angle. The longest side of this angle, that is the side opposite the right angle, is called the hypotenuse, the other sides are simply termed

sides, or, as some people prefer to say, legs.

Fig. 2, the obtuse angled triangle, is one that has an obtuse angle as shown.

Fig. 3, the acute angled triangle, is one which has all its angles acute.

Fig. 4, the equilateral triangle, is one (as the name denotes) having all its sides equal.

Fig. 5, the isosceles triangle is one, two of whose sides are equal.

The altitude of a triangle is the length of the perpendicular drawn from the vertex to the base, see line A on Fig. 5.

Fig. 6 illustrates the scalene triangle. This triangle has three unequal sides.

The lowest side of a triangle is always called the base. Any side may of course be taken as the base, but usually the side upon which the triangle is supposed to stand is generally accepted as the base.

## Quadrilaterals

Polygons are again subdivided into quadrilaterals, or polygons with four sides, of such shape and names as follows:

A quadrilateral is, to commence with, a figure bounded by four straight lines (see Fig. 7).

A parallelogram is a quadrilateral whose opposite sides are parallel (see Fig. 8).

A rectangle is a parallelogram whose angles are all right angles (see Fig. 9).

A square is a parallelogram whose sides are all equal, and whose angles are all right angles (see Fig. 10).

A rhombus is a parallelogram whose sides are equal but whose angles are not right angles (see Fig. 11).

A trapezoid is a quadrilateral having only two sides parallel (see Fig. 12).

But enough of definitions in this section, so let us get on to plate No. 5.

As will be noticed, this plate is divided into six problems, each dealing with polygons in one form or another. As before, the dimensions are 9 in. by 13 in. for the border lines, and 9½ in. by 13½ in. for trimming. Divide the 8 in. by 13 in. space into six portions as shown and proceed as follows:

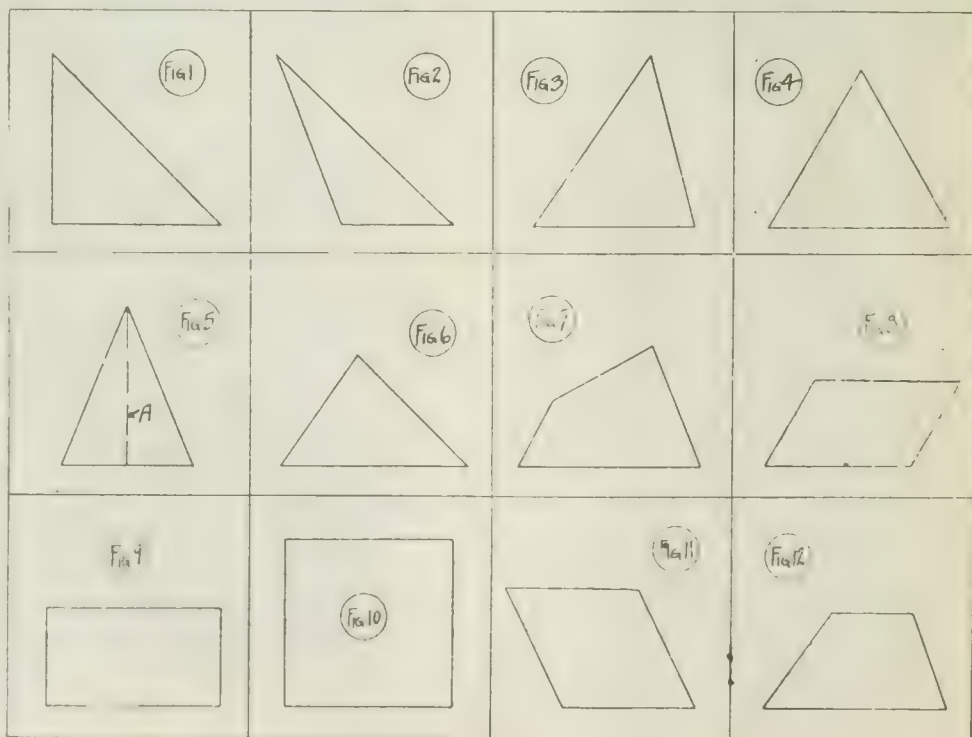
## Instructions For Plate 5

Problem 1.—To construct an equilateral triangle, one side being given.

Draw A B 2¼ in. long. With A B as a radius, and A and B as centres, describe two arcs intersecting at C; join CA and CB. The result being an equilateral triangle.

Problem 2.—To construct a parallelogram when the sides and one of the angles are given:

Suppose AB and CD to be the given sides, AB 2¼ in. long, CD 1¾ in. long. Let E be the given angle. Draw FG equal to AB and draw GH, making the angle with FG similar to the angle E.



FIGS. 1 TO 12—SHOWING VARIOUS TYPE POLYGONS.



Make the line GH equal in length to CD. With H as a centre and a radius equal to AB, describe an arc at I. With F as a centre and a radius equal to CD, describe an arc cutting at I; join FI and IH, when you have constructed your parallelogram.

Problem 3.—To inscribe a square in a circle:

Draw the circle, as shown, 3 in. diameter; draw next the two diameters AB and CD at right angles to each other; join these points of intersection with the circle, and in short order you have a square completed as shown.

Problem 4.—To inscribe a regular pentagon in a given circle:

Draw the circle as shown 3 in. diameter; draw the two diameters AB and CD as before; consider the centre of the circle as the letter O; bisect OB as shown at E (note: your previous plate gave this problem of bisecting a line). With E as a centre and EC as a radius draw the arc CF, cutting AO at F. With C as a centre and CF as a radius, draw the arc FG, cutting the circumference of the circle at G. The chord GC is one side of the pentagon. The rest of the construction is left to the student, for it is self apparent, the one side being obtained.

Problem.—To describe a regular octagon in a given circle:

With O as a centre describe a circle 3 in. diameter; draw the two diameters

**Tear off and send with drawing**

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AB and CD, bisect angle AD at E, and draw line E to F; bisect the angle AC at G, then draw GOH. Join the points of intersection with the circle and you have your regular octagon constructed.

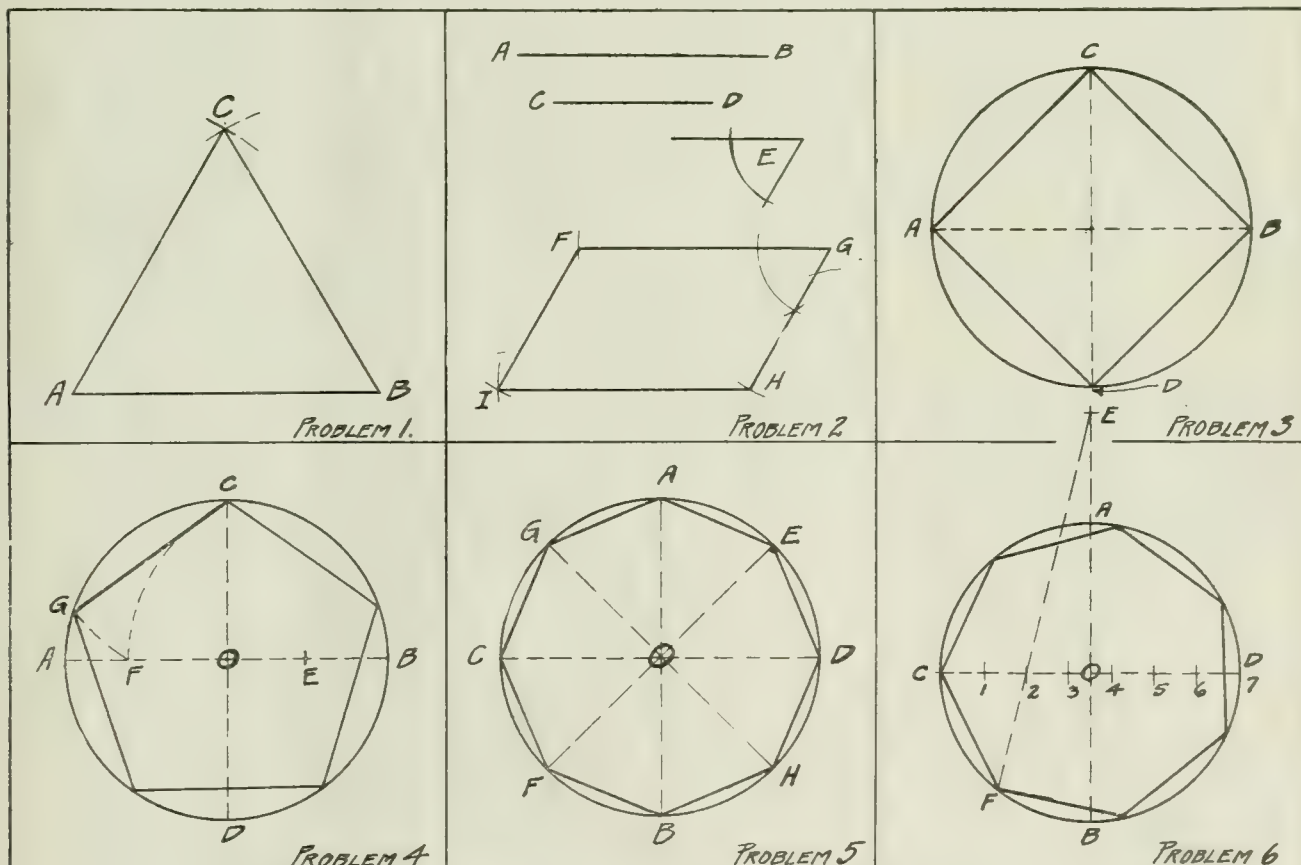
Problem 6.—To inscribe a regular polygon of any number of sides in a given circle:

With O as a centre draw a circle  $2\frac{1}{2}$  in. diameter. Draw the two diameters AB and CD; prolong AB as shown, making AE equal to three-fourths of the radius OA; divide the line CD into as many equal parts as the polygon has sides as shown at 1, 2, 3, 4, 5, 6 and 7. (Of course this can be any number). Now draw a line through points E and 2, cutting the circle at F; draw the chord CF, this is one of the

sides of the polygon. Of course the others are easily obtained by spacing off around the circumference.

This completes plate 5. Print in Problem 1, etc., in their proper places, also be sure and print in the title, for it is all good lettering practice. Keep on sending in your plates.

**Cleveland.**—There is less grain in stock in elevators at the head of lakes than at this time last year. Elevators at Chicago, Duluth and Fort William were holding at last reports 43,920,000 bushels of all kinds of grain, compared with 58,800,000 bushels last year. There has been a good movement from Port Arthur and Fort William recently, and most of this has been carried in Canadian vessels.



**CANADIAN MACHINERY DRAFTING COURSE**

NAME .....

ADDRESS .....

PLATE No. 5

THIS COURSE DEPENDS ON YOUR REPLIES FOR ITS SUCCESS. ARE YOU SENDING ON YOUR WORK REGULARLY?







occurs, due to belt shifters, drives where the belts run over small pulleys, belts with idlers and tighteners, high or low speed belts, vertical belts, horizontal belts, long and short centre distances between driver and driver pulleys, high and low powered belts, wet surroundings, greasy drives, etc., all common to nearly every factory. All these conditions call for certain common characteristics in belts and qualities necessary for a certain drive may not be at all essential to others. A little study shows what the most important characteristics are. For example, a belt where a shifter is used must successfully resist rubbing on the edges, small pulleys are more destructive than large, because they bend the belt to a greater extent. Excessive moisture or oil, when present, increase the tractive difficulty as do short drives. The horizontal drive is easier than the vertical drive. A practical belt test under such conditions discloses its characteristics in these particulars. It shows that leather resists rubbing on the edges better than belts from woven materials. Also under certain greasy conditions leather will not always do as well as certain other materials.

To obtain a reasonable idea of the value of various kinds of belting need be neither expensive nor yet long drawn out. Drives selected for test should be of sufficient difficulty to disclose the merits of the tested material in a short time. Such a test, when the material fails, often discloses characteristics valuable and sometimes superior for other applications. A brief trial or two of this kind usually furnishes the information necessary to determine where further tests can advantageously be made. Drives where trouble is found often furnish suitable places for a trial. In this connection a warning may well be sounded against too severe a test, for really good material has sometimes been condemned by senseless and unreasonable tests. Common sense is as necessary here as elsewhere.

An illustration of the knowledge gained from a test of this character will be of interest. The drive was from a main line to a countershaft. Considerable power was transmitted and, due to the presence of a clutch, considerable oil was present. It was considered a difficult drive. Oak leather was the initial belt and afterward two woven belts were used on two similar drives with very close to the same conditions. One of the trial belts was of woven material folded to make several plies and finally stitched together and impregnated with a waterproofing substance. The other was woven to the desired thickness in one ply. The results were as follows: The leather belt became saturated with oil and then lost its tractive capacity; the folded and stitched belt ran successfully until the outer ply wore out, including the stitching, the plies then separated and the destruction of the belt soon followed. The third belt was still running in good condition long after the others were useless. It was found that the second belt

carried the drive as long as three leather belts and not as long as the third trial belt. The leather belt, however, had a reclaim value not possessed by the woven belts.

Cost of 3 leather belts .....	\$24.62
Reclaim value .....	14.77
Belting cost .....	9.85
Cost of folded belt .....	4.78
Saving over leather belt ....	5.07
Cost of single ply belt ....	3.51
Saving over leather belt ....	6.34

The lesser risk of shut down in the case either of the two belts tested was of considerable value and a still larger balance in their favor could readily be shown.

The success of the institched belt in this trial suggested its use for a spindle drive on the radial arm of a large drill press where, due to a poorly arranged oiling system, much oil was present. This made it a difficult drive for leather belting. The trial belt here was a success, though the life was not great, due to the destructive effect of the small pulleys used.

Another installation, a wet grinder, proved a leather belt of special tannage, superior to anything else, for it had long life and excellent driving power, notwithstanding the large amount of water present. The other belts were less successful under these circumstances.

These tests all required some time and attention, but most of this was furnished by the millwright foreman, who was easily interested in making the tests. In fact it was the interest on the part of this foreman which was instrumental in carrying the test to a successful conclusion in each case. The point of greatest interest is, however, the fact that the tests were made with no interruption of regular factory operation and at practically no expense. The results were worth many dollars to the firm.

One of the much-mooted questions in many factories is the question of a proper cutting lubricant. Many hold there is nothing equal to a good grade lard oil. Others, however, find an advantage in the use of other fluids. Due to the many variable conditions present such as the operator's opinion, the quality of the cutting tools, the grade and condition of the material worked, etc., definite comparisons of performance are not readily set up. However, an analysis of these conditions will point out what may be called a typical job on which the cutting fluid may be given a trial. The result of such a trial will demonstrate in many instances the value of the goods not only for the job, but also for the usual run of work.

In a certain instance turning and threading nickel steel bolts was selected. A very good thread was required and the work was to fairly close limits. It was found that the behavior of the chasers

and the finish of the thread furnished a reliable criterion of the value of the cutting fluid. Based upon this test quite a large saving was effected in the cutting fluid costs and a better quality of work resulted. The deterioration of the machinery and tools was also considerably less.

These instances suffice to indicate the importance of selecting the place and conditions of test before making trial of the goods. The trial should be selected in such a manner as to afford as clear cut a comparison as possible of the materials tested and as wide application to other conditions as may be practical. In fact this initial selection is of the greatest importance. Tests on a large scale are necessarily expensive, often cause much interruption and frequently afford no tangible results. Restricted tests wisely selected and interpreted can usually be made to afford sufficient information for all practical purposes.

By such methods and principles of trying out and selecting the many kinds of supplies used in every factory may be purchased to an increased advantage.

#### READERS, ATTENTION!

Every week that you read these pages, is there not some stunt or idea that crosses your mind, some scheme you used with good success in your experience? Of course you think of these things as you read the various devices shown in this section, but—it's a big one—do you follow out your thoughts by sending us in your ideas? If you do, well, you're one of the wise ones. If you don't, there is something wrong. We pay good space rates for acceptable material and are always glad to consider your work. Granted that you may not be much of an artist, but send us a rough sketch anyhow; we will do the rest. Once more let us repeat: "Send us your work for consideration."

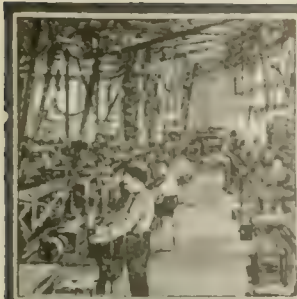
#### ALUMINUM-WELDING A LARGE HOLE

The "Journal of Acetylene Welding" says that when the welding of a large hole is required a chill of galvanized iron is provided, backing up the hole and welding against this when filling the hole with aluminum. Galvanized iron is preferable to any other material, such as tin or iron, since it peels away from the aluminum quite readily, and can therefore easily be removed after the weld has been completed. This is undoubtedly due to the zinc content of the galvanizing composition.

The chief value of the use of the chill is that it causes the filler to cool and harden prematurely, thereby preventing it from contracting after the weld is finished. It also prevents the heat of the weld from spreading, which might cause the job to crack back.

The chill causes the added metal to cool almost as fast as it is connected to the edge of the break. After the weld has been finished and cooled, the chill can be removed by gently prying it away from the weld by means of a cold chisel.





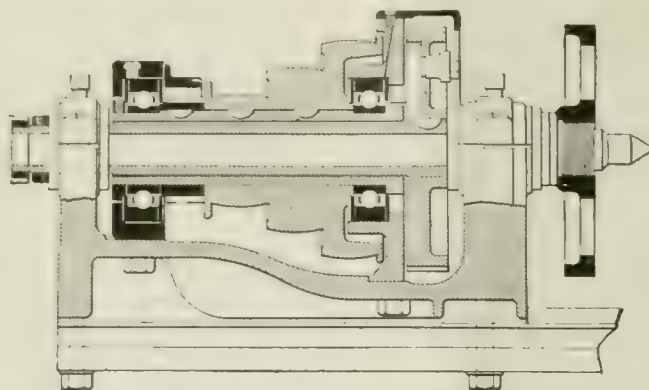
## DEVELOPMENTS IN SHOP EQUIPMENT



### FLATHER 7-IN. MANUFACTURING LATHE WITH BALL-BEARING CONE

The Flather Manufacturing Co., Nashua, N. H., is now marketing a new 7-in. manufacturing lathe that has unusual features in that the cone is mounted on a set of ball bearings, while the spindle is of the floating type mounted on separate bronze bearings. Fig. 2 shows the design of the headstock. The machine is a manufacturing lathe and has been designed to supply the demand by manufacturers and toolmakers for a standard, rigid, compact, high-speed, screw-cutting engine lathe for accurate work within its capacity, which is about 8 in. over the ways and 15 in. between centres, with a bed length of 36 in. The bed is broad and deep, is braced with cross webs and has bench legs cast integral. In case it is desired to use the machine as a floor type, it can be bolted directly to a pan and legs that can be supplied. All beds are planed and scraped to receive the taper attachments, which are interchangeable on any of the machines.

The headstock has long bearings on the bed and is webbed. The spindle is of high-carbon steel with a  $\frac{3}{4}$ -in. hole bored through to accommodate a draw-in chuck with collets up to  $\frac{1}{2}$  in. in diameter. The front end of the spindle is reamed to a Morse taper. The spindle bearings are of special bronze, and the cone, which runs on its own ball bearings, is for a  $1\frac{1}{4}$ -in. belt. This cone is mounted on bearings held in separate housings from those carrying the spindle boxes. This method of construction allows the spindle to run freely and takes all belt pull off the spindle bearings. Rack gears are provided, the ratio being 7 to 1.



SECTIONAL VIEW OF HEADSTOCK SHOWING BALL BEARINGS.

The carriage and apron are heavy, the carriage being arranged with long bearings and felt wipers. A feed stop is incorporated that can be set for any length of feed, this stop automatically disengaging the feed clutch when the required length has been reached. The lead screw is held by a middle bearing on which the step nut acts, leaving the screw free at the back end for expansion and contraction. The nut is of cast iron, and is operated by a cam milled to allow the nut to be closed firmly on the screw. The cross slide is graduated for adjusting the compound rest and the cross-feed nut is so arranged that it does not have to be disconnected when using the taper attachment. A countershaft of the two-speed, double-friction type is furnished and is operated by double toggle joints.

### JOHANSSON GAUGES AND FIX- TURES

After an absence of thirty-five years, C. E. Johansson has returned to this country, bringing with him from his Eskilstuna factory in Sweden some

special precision instruments to supplement and broaden the scope of his standard blocks, which are marketed here by C. E. Johansson, Inc., 245 West 55th St., New York City.

The set of angle blocks shown in Fig.

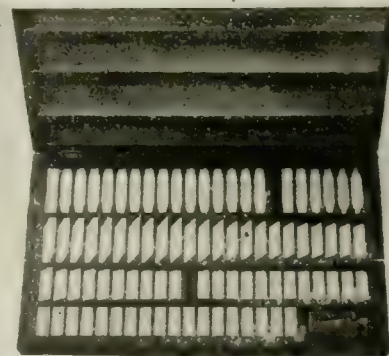
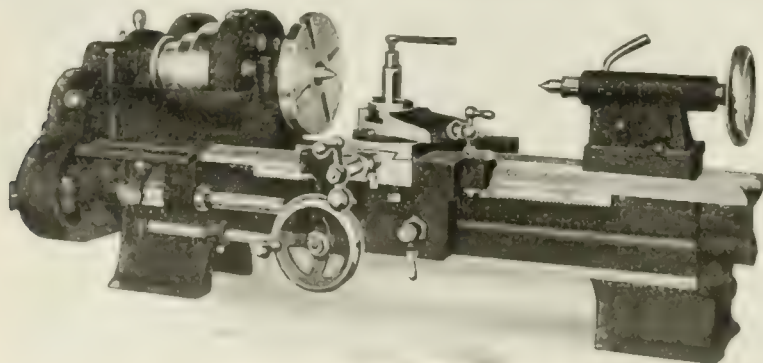


FIG. 1 THE COMPLETE SET OF ANGLE BLOCKS.

1 is probably the one of these new instruments which seems to have the widest field. This set is about the same size as the standard set of size blocks, but each block, instead of having parallel edges, has each of the four corners beveled off at a different angle. The angles have been so worked out that combinations from 1 min. of arc to 270 deg., varying by minutes, are possible. These blocks can be combined with the regular size blocks for making gauges for angular formed cutters, checking sine bars, etc.

Another set of blocks, Fig. 2, is of more interest to the scientist than to the manufacturer or toolroom foreman. The set consists of 11 flat size blocks claimed to vary by equal amounts from



GENERAL VIEW OF FLATHER 7 LATHE



0.10000 in. to 0.100010 in. As to just how one would use these blocks so that they would not be affected by the warmth of the body of the operator does not seem very apparent, but the scien-

the lower table and plug in the upper one. This fixture lends itself to a variety of uses in the shop and tool-room where quick and accurate work involving close measurements is to be done.

#### "FULFLO" REVERSING PUMP

The Fulflo Pump Co., Blanchester, Ohio, has just placed on the market the reversing centrifugal pump illustrated. Its design includes the prime-retaining, non-clogging features of the other pumps of this line with the reversing feature in addition.

The ability to reverse the flow of water or coolant through the pump is obtained through the design of the impeller blades and the introduction of a bronze deflecting gate in the discharge passage. As both openings are at the top of the pump it is always primed and will immediately start the flow of the liquid in either direction, depending on the direction of rotation of the driving pulley.

The pad for mounting the pump is detachable and may be located in any one of three positions at 90 deg. to each other. It is fastened by two flush-head screws.

As regularly furnished with  $\frac{3}{4}$ -in. pipe, the pump has a capacity of 15 gal. per minute with a 15-in. suction lift against a 4-ft. head at a pulley speed of 450 r.p.m. When equipped with 1-in. piping the discharge can be easily increased. Variation of the pulley speed naturally varies the output of the pump.

#### STANDARD ROTARY END-HEATING FURNACE

The rotary end-heating furnace shown in the illustration is a recent product of the Standard Fuel Engineering Co., 1646 Woodward Ave., Detroit, Mich., and is intended for heating for hardening the ends of tools and other steel parts in which a local application of heat is desired. The lower part of the furnace body consists of a revolving table on which the pieces to be heated are to be laid, the ends projecting into the heating chamber. The operator stands in front of the furnace where one segment of the heating chamber is removed and deposits the pieces to be heated on the table and removes each piece as it emerges from the furnace after its rotary travel around the heating space. In the illustration the driving mechanism is shown at the front of the furnace in order to show its construction, but this is turned around to rear out of the way when the machine is in use. Small tools or other pieces of steel may be heated all over by placing them on that part of the hearth that travels through the heating chamber. The heating chamber itself has a vertical cross-section of 4 in. wide and  $4\frac{1}{4}$  in. high, and the height of the opening through which the tools project into the furnace is  $1\frac{1}{4}$  in. The height to the table is 36 in. and the outside diameter of the machine is 45 in.

**Site for New Dock.**—The Federal Government have located a site for the new dry dock they are going to build in Esquimalt. The negotiations have been extended over several weeks, and the position chosen is Skinner's Cove, Esquimalt.

FIG. 2—A SET OF BLOCKS OF PARTICULAR INTEREST TO THE SCIENTIST.

tist who may use them will undoubtedly devise a means.

Fig. 3 shows a laying-out and locating fixture for use in combination with Johansson size blocks. The two movable beds are shifted by accurately cut

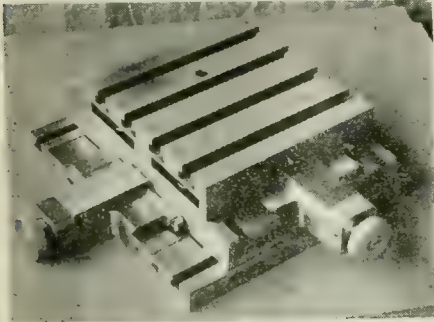
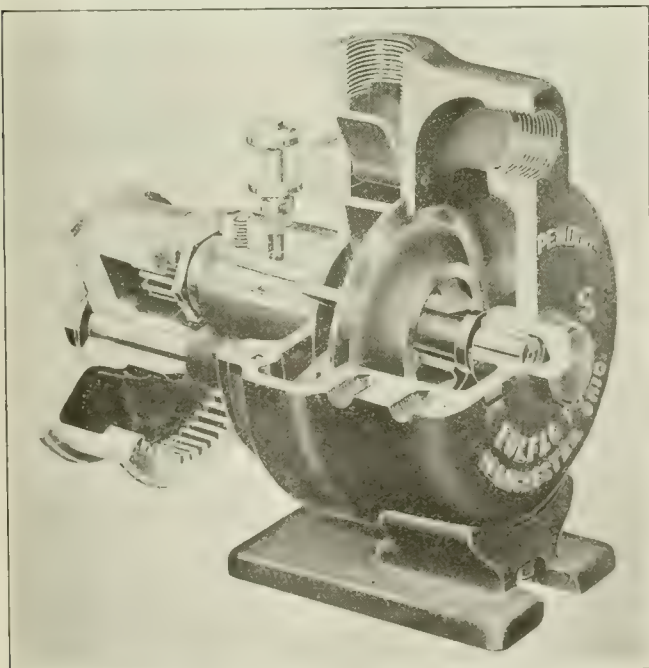
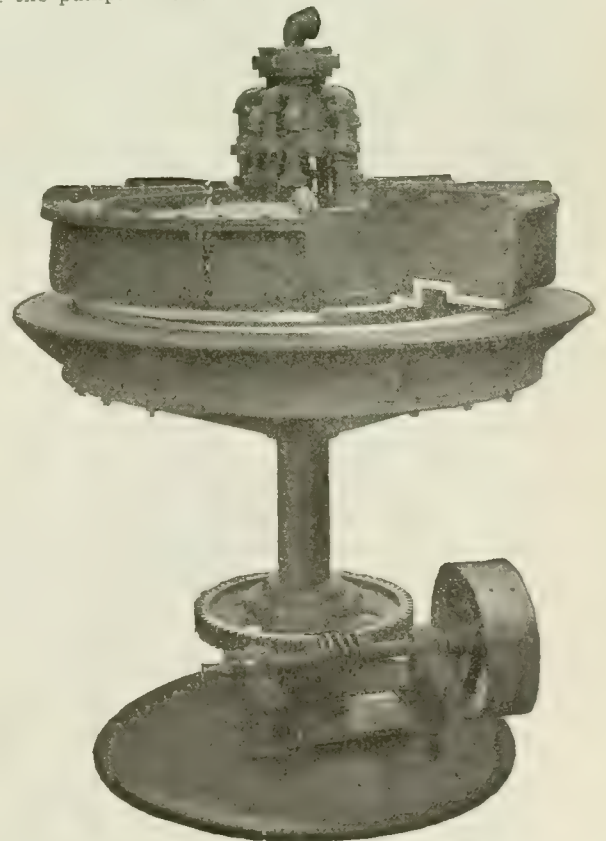


FIG. 3—A LAYOUT AND LOCATING FIXTURE USED IN CONJUNCTION WITH JOHANSSON SIZE BLOCKS.

screws ending in the large knurled nuts shown, and the size blocks are inserted between a carefully finished surface on



SECTION VIEW OF THE FULFLO REVERSING PUMP.



GENERAL VIEW OF THE FURNACE.



# The MacLean Publishing Company

LIMITED

(ESTABLISHED 1887)

JOHN BAYNE MACLEAN, President H. T. HUNTER, Vice-President  
H. V. TYRRELL, General Manager.

PUBLISHERS OF

## CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly journal devoted to the machinery and manufacturing interests.

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Office of Publication, 143-153 University Avenue, Toronto, Ontario.

VOL. XXII. TORONTO, October 30, 1919 No. 18

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## Canada Should Take Notice

THE strike fever that has seized United States may bring home to Canada a lesson that must be learned, namely, that this country must become more self-contained. Should the coal strike become serious, we will suffer, and the steel strike has already gone far enough to look dangerous to Canadian industry.

When things are going well we are too apt to regard it as a very easy matter to bring steel and coal across at a price that is hard to overtake here. As things are shaping at present, industrial Canada is liable to become indirectly the victim of all the agitations carried on by the foreign labor leaders in United States.

Having our supplies of coal and a great deal of our steel at the mercy of the radical labor element in the States is a condition that, in view of the great resources of this land, we cannot face with any degree of complacency.

Were soft coal shut off completely, United States would suffer more industrially than Canada by reason of the great advances made here with water power development. But we are still in the market for U. S. coal, as the records of our imports show. For twelve months, ending March, 1919, we imported in coal, coke and charcoal a total of 78,913,921 tons, and every bit of this, with the exception of 2,824 tons, came from United States.

To get some idea of the amount of finished steel and iron coming to this country, the Government reports for twelve months, ending with March of this year, show an importation of 5,376,931 tons of plate.

In sheets the tonnage from United States amounted to 6,058,316 tons.

Of pig iron approximately 2,000,000 tons.

Angles, beams, etc., for ships, 8,324,780 tons.

These items are only a few, taken for the sake of showing the extent to which this country depends on

the coal mining and steel and iron making industries of United States.

The growth of labor trouble in United States, where there is such a large percentage of foreigners in these basic industries, makes it increasingly urgent that Canada should think seriously along these lines.

If this country, as well as suffering from its own labor troubles, is going to become a fellow sufferer every time the labor leaders of United States call "strike," it is high time we laid our hands on our own great natural resources, and seriously undertook the task of discounting the great distances that at present separate our coal and ore bodies from the industrial sections of Canada.

## The Strike of the Miners

THE spectacle of half a million miners quitting work on the eve of winter because they failed to make a new agreement with the operators is mighty poor entertainment.

The miners and operators were in conference for four days, during which the chief pastime was getting an alibi ready when it came to fixing responsibility for freezing the public.

The man who, in the long run, pays the shot for the outcome of all these wrangling and talkfests is the consumer.

The present strike is just another of "the public be damned" incidents that are becoming so common as to excite no comment.

As far as the consumer is concerned, the miners and operators have made one fine mess of coal mining in Western Canada and in the regions across the border.

We are fast approaching a state where the little man, the consumer, will be told in trombone tones; when he mentions his rights as a citizen, "You aint got any."

Apart from that it looks as though the troubles of the United States were far from settled.

Their production is bound to suffer in all lines. Whether some mild form of Bolshevism has gained a footing is hard to state. But to be honest and blunt, it looks like it.

## The Use of Time Clock

WHEELS move within wheels. A few years ago when nine or ten hours was the day's work, time clocks were usually at the entrance to the factory, and anything from three to five minutes from the various departments.

With the coming of the eight or seven and a half hour day, these clocks have been moved and multiplied and the rule is, in most cases, that actual operations shall start at the time when the employee used to enter the shop.

The sale of time clocks has grown enormously with the shortening of hours, due to a desire of the management to combat the tendency toward decreased production by securing continuous effort every minute the man is in the shop.

The use of time-recording instruments is fair to all concerned. They save many a squabble for the time-keeper, and they are now made with such precision that their record can be accepted without question.

## Back to Standard Time

STANDARD time is having its innings once more, much to the relief of all concerned.

There are cases where the change works advantageously, and there are cases where it will not work at all.

On the whole, it is hard to see where there is enough advantage to warrant the change.

It has yet to be shown that we can make any great improvement in affairs by tinkering with the clocks.

There are numerous cases where the same end can be achieved by buying an alarm clock and being about early in the morning.

There are plenty of things a hundred times bigger for the Federal House to bother with than having a session at clock tinkering.



## The Gold and the Dross

**PARTICULARS** of a will probated in an Ontario court were published, along with others, a few days ago. There were a number of so-called securities left to the widow and children. To look at the lot it might be supposed that they represented a fairly good living for some years to come.

But get under the surface. They were doubtful industrials, a few mining stocks, cash in the bank and some Victory bonds. The total in figures of the stocks looked big beside the size of the Victory bond holdings, but in actual worth the investment in bonds was worth more to the family in trouble than all the others combined. They were of doubtful value. They might have been bought with the idea of a quick sale, but the man who was going to attend to this had been called, and no one knew his plans.

But there were the Victory bonds. They were just as good with the purchaser of them away as with him there to look after them.

That is the big point in the Victory Loan campaign that is on now. Every cent gets you something real. Something that has more security behind it than a first mortgage, or a municipal or bank bond. It is such a good investment that all that is necessary is that it should be offered to the Canadian people. The chance to "get in" on such a security does not come often to the small investor.

## A Mighty Poor Exhibition

**UNITED STATES** authorities have a small conception of the use of police and militia, when they call on them to stand guard while a grand opera company bawls out a few scores of German song in New York.

Mounted police charged a crowd that threatened to clean out a playhouse in New York where some of this German gibberish was being staged.

In the fracas that followed one man, a sailor, had his head split and was rushed to the hospital in dying condition.

All honor to the U.S. troops that had their heads split in fighting to keep German civilization from sprawling itself all over Europe.

But there's no honor in calling out U.S. cops to crack heads so that German songs may be sung in a land where homes are saddened by the acts of German murderers at sea.

If United States cannot get enough songs sung to it without dabbling in German songsters, let United States go empty for song.

The spectacle of U.S. police battling indignant citizens in order to protect German opera in New York is a mighty thin and white-livered sequel to hang up against the bravery and devotion that U.S. men showed on the Western front.

## National Salesmanship

**IF** Canadian manufacturers are to get into the markets of the world, their products must be better known than at present.

Inquiry made by **CANADIAN MACHINERY** of many large firms of importers in Australia, South Africa, Sweden, etc., brings out the information that Canadian products are not well known. The answers received contained the admission in several cases that the firms were not familiar with lines made in Canada.

It would be of more assistance to Canadian export trade to have the Trade and Commerce Department give some help in this direction than to have tariffs heaped on until they were in the prohibitory class.

There is a big opening in the world to-day for many things Canada can make, but people in South Africa or Australia, or in a dozen other parts of the world are not going to trot over this country and wander from town to town finding out what we want to sell them.

Canada needs an injection of national salesmanship more than she needs anything else in the way of industrial encouragement from the Government or any of its branches.

## A Joyful Thought

There is a keen, a subtle joy, in autumn's cooling clime, that makes it quite a pleasure to tear off yards of rhyme. We sing no more of summer days, of rivers or of lakes, of squattin' on a piece of rock just where the breaker breaks.

Nor yet of strips of wooded land, of cottages nor camps, with a hundred bugs and spiders and a dozen kinds of ants.

Begone such things, there, flee away, you're but a memory now—likewise the country scenes as well of piglets and of cow. We think of sterner things this month, of taxes and of coal, there's window sash and double doors to rend and vex the soul.

And underwear as thick as pie, it costs like silk and plush, to cover up the system from the snow flakes and the slush. But let us sing in joyful way, oh cheery be our tune—and blast it out at morning time, and then again at noon.

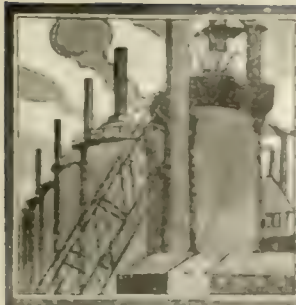
While seasons come and seasons go, there's recompense for each, the spring time has its budding tree, the fall its squash and peach. But, ah, to us, the thing that is of all things wondrous fine, concerneth not the things we see, nor things on which we dine.

We blush almost with modest joy to mention this here thing, of which we're moved upon this day to versify and sing. But when the warming rays of Sol get on their northern slants, your winter coat will cover up the patches on your pants.—ARK.

**AN ITEM** appears in a contemporary, stating that the construction of a steel ship of 6,500 tons is about to be commenced in the Three Rivers shipyard. This vessel is claimed to be the largest steel ship ever built in a Canadian shipyard. This is not the fact. There have been a number of steel vessels built on the St. Lawrence and on the Pacific coast of Canada much larger than this, while contracts have been let for steel ships of 10,500 tons, and the keels actually laid. We are speaking, of course, in terms of deadweight, and we take it our contemporary is using the same measurement. If, however, they are speaking of tons gross, the vessel will not be the largest ever laid down in Canada, as the deadweight capacity would only be 9,700 tons, as against 10,500 tons being built in Nova Scotia.







## MARKET DEVELOPMENTS



### Shipments from Strike Zone Are Not Good

In Some Lines No Material Has Come Across for Several Days—  
Premiums Are Being Secured by Some of the Jobbers Who Have  
Material on Hand—Scrap Markets Are Uncertain

**A**LTHOUGH it is claimed by the steel mills of United States that the strike there is being broken, and that gains are being made in the list of the mills producing, it can be said that the result is not to be noticed in the shipments that are coming across the line. Of course, there are cases where delivery is fair, but in others the material is not in sight. Warehouses have been cleaned out of several lines, and it is not an uncommon thing now to hear of premiums being paid for certain much-wanted lines. In particular these are sheets and plate, one warehousing firm stating this week that they did not even have a piece of galvanized iron that they could hand over to a good customer as a sample. When it is stated that for the year ending with March of this year this country imported 5,376,931 tons of plate from United States, it is easy to see that a fifty per cent. interruption in such a volume of business for any length of time is going to run into a lot of material. This volume also represents actual requirements, as there has been very little material purchased in this country for stock purposes in the last few months.

The big steel companies doing business in this country

seem to have set their faces against any increases in prices, and when this takes place it is after the jobbers have secured the material and are reselling. Another feature that tends to aggravate the situation is that when mills that are operating get hopelessly booked up they withdraw from the market, thus making it harder to get any responsible place to take business with any chance of delivery. First quarter 1920 selling is going on here with the distinct understanding that deliveries are subject to strike conditions.

Machinery sales are holding up well, but nearly all are to be traced to the auto industry, or to interests that have taken contracts for the production of parts. One standard line of lathes this week notified the trade of a ten per cent. increase, bringing the machine to above the war prices.

Uncertainty seems to settle on the scrap metal market. Coppers are not showing strength, probably because second quarter 1920 copper is quoted now below present figures. Some material is coming from the Old Country to Canada for resale in United States.

### SHIPMENTS OF MATERIAL HAVE NOT BETTERED AT MONTREAL

Special to CANADIAN MACHINERY.

**M**ONTREAL, Que., Oct. 29.—The local situation has reflected the near approach of the Victory Loan campaign, and also the fact that the Prince will spend the current week in Montreal. These incidents have not interfered with the regular run of business, but the interest displayed has detracted from other matters. The general undertone, as gathered from information obtained from dealers and manufacturers, is one of gradual improvement and increasing activity. There is a steady demand for many commodities, and although the requirements are not always large, the movement is steady and regular, in most cases. The inquiries for used equipment is gradually falling off, largely because the supply is decreasing. Sales of new material are becoming more pronounced. The factor of the delivery is an interesting one, as delays are frequently experienced when goods are brought in from the states. While we are given to understand that the situation,

as regards the steel strike in the States, is improving and that mills are operating close to normal, there is nevertheless an atmosphere of uncertainty surrounding the steel market. While the situation here does not seriously reflect the curtailment of steel that must have resulted by the shut-down of the mills, the reports would imply that the situation is not yet entirely satisfactory. It may be true that the production is ample to meet the demands, but in such cases as tubes and sheets, the delivery to local dealers is still of uncertain character.

#### Unchanged Metal Market

There is little to report in the metal situation, other than that a steady business is still carried on, but of light volume. The strike of steel workers has had a little indirect influence on the metal market but this is becoming less pronounced. The general demand is for small regular supplies, and quotations are firm and unchanged. (Through a printer's error, last week's metal quota-

tions were not altered to conform to the changes mentioned in the Montreal letter.)

#### Machine Tools Moving Steadily

The machine tool situation is much the same as that of the past several weeks, with the general sales of fair volume and wide distribution. There appears to be less used equipment available just now, and in many respects the current demand leans more to new tools. One feature of present activity is the demand for different size motors, much of which is for used machines. In one instance a local firm made a sale in the neighborhood of \$15,000 for used motors and generators. Tool dealers are favorably impressed with the movement of equipment and are generally optimistic on the possibilities of winter business, many believing that the coming year will develop an extremely good demand for every class of machine tool equipment. There is a good demand for supplies, but in some regards the maker may be classed as a competitor of the dealer, as the manufacturer in many instances are selling direct to the consumers, so that the dealer must be content with smaller profits when making sales.



### Scrap Moves Moderately

Little activity has been apparent in the movement of scrap during the week and dealers reports are to the effect that the bulk of present buying, which in the aggregate is comparatively light, is of a conservative character, as few future sales are recorded. Local foundries are steady purchasers for small regular supplies. The market may be qualified as nominal, and price quotations are more of a guide than to the actual figures that would apply for a definite sale. The prices quoted, however, are a fair average of what the dealers will offer.

### SHIPMENTS DO NOT SHOW IMPROVEMENT

And Firms Depending on U. S. For Raw Material Are Having an Anxious Time

TORONTO, October 29.—Although very few complaints have been made openly so far, it seems increasingly certain that the United States steel strike is going to result in stinted supplies for certain important Canadian factories. Shipments are coming through very poorly, and the stocks in this country are not in shape to provide anything like a reserve to draw from.

There is a nice volume of business going in nearly every department. Warehouses (where they have the material), machine tool and small tool dealers, and scrap metal yards are handling a fair amount of trade in spite of the fact that shipment to United States points is largely held up.

### The Steel Situation

There has been a great buying movement in this corner of Canada for the last three weeks or so in the lines that are usually carried in the warehouse business. The prospects of the strike coming on created something like a small panic. For a long time before that there had been no haste to get into the market, although dealers and mills advised the trade many times that nothing at all was going to be gained by staying out to look for better prices. The result was that stocks were low when the strike came, and there was an immediate rush to gather up anything that was available. There could be only one result, and that has come to pass, viz., many of the warehouses now have little or nothing to offer to the trade.

The gains of mills turning again to production in the strike zone are very slow. Those mills that have been operating steadily have been smothered with an avalanche of orders, so large that in many cases they are now withdrawing from the market, leaving the would-be buyer with no place to put his business. One Toronto concern tried several times to have business transferred from a booked-up mill to one that might take on more orders, but was unsuccessful.

"There has been a tremendous warehouse trade in the last four or five weeks," stated one of the dealers to

### POINTS IN WEEK'S MARKETING NOTES

The United States coal strike, if not prevented, will mean a shut-down for many of the Canadian as well as U. S. plants.

Japan is buying machinery for making automobiles in that country.

In New York one dealer took in thirty used lathes and sold them in a week.

Delivery is of greater concern than price in machine tools at the present time.

Shipments of sheet and plate coming to Canada are not improving, and a shortage of raw material is anticipated.

Recovery in production at the U. S. steel mills proceeds very slowly, and many mills that are operating become so booked up that they have withdrawn from the market for the time being.

CANADIAN MACHINERY to-day, "but the trouble comes now when we want to buy for our own stock, we can get nothing at all."

A very fair shipment of boiler tubes arrived this morning. They were assorted sizes, from two to four inch. They have been much wanted for some time, and their arrival was none too soon.

It is the opinion of several very close to the trade that the shortage of supplies is certain to be felt in some circles before very long. Automobile, shipbuilding and agricultural industries are doing a lot of buying just now, and it is only natural to suppose that they will be among the first to feel the results of the trouble across the line.

Stocks of sheets are practically cleaned out. Gauges such as 14 and 16 are wiped off in some of the warehouses in Toronto.

"How about galvanized?" queried CANADIAN MACHINERY.

"We haven't a sheet that we could give you as a sample," was the prompt and emphatic reply.

As a matter of fact the filling of orders is a matter of some difficulty just now, and transferring of odd lots of stock from jobber to jobber is being done at more or less of a premium. It is another case where the price has not very much to do with the business at all. It is more a case of getting the material than haggling over the price that is to be paid for it.

Reports seem to differ as to the amount of material that is coming through from the mills in the strike zone. Some places the reports are that for almost a week now they have not

seen a shipment of sheets or plates getting across, nor can they find out that they have anything on the way. In other places the reports are more encouraging, and the claim is made that the amount of material coming across is showing an increase. Advices indicated that a considerable tonnage for Canada has been rolled but cannot be sent away from the mills on account of the shortage of labor necessary to load the material.

Business that is being booked now for first quarter steel is being made very plainly subject to strike conditions by the sellers here.

### The Machine Tool Market

Canadian machine tool men who have been through the shops of several machine tool builders in the United States report that in nearly every case they are booked ahead. Stock orders are practically unknown now, and deliveries are not improving. They are as a general thing from one to two months off. The interests in United States that are doing the bulk of the buying are following closely the same lines as in this country, and are headed by the automobile business.

One of the standard lines of lathes has announced a 10 per cent. increase, but otherwise prices are holding at the same mark that has been quoted previously. Dealers and salesmen are hoping they stay there for a time.

The movement in used machinery is brisk, and a fair stock of these, which have been rebuilt and overhauled, are arriving in some of the warehouses in the city.

### The Scrap Metal Market

Coppers are not showing any particular strength. In fact there is a decided uncertainty in the whole situation at the present moment. This is probably due to the quotations that are given in New York now for No. 1 standard ingot copper for second quarter of 1920, for 21½¢. Trade must look for cheaper markets and plentiful supplies, else that quotation would never have a chance to be made. This has a tendency to flatten out business in the scrap market in these lines. Lead is fairly strong, spelter is holding about the same.

Conditions are rather chaotic in the scrap market for the moment, and it is only fair to say that the figures given in our price list are more or less nominal. Some buyers might be willing to take on anything in the list at the price, while in other places the same offerings would be discounted. The strikes and the general feeling of unrest in United States keeps the buyers there out of the market, although it is a fact that some tonnage is now coming from the Old Country to Canada, and from here sold to United States.

The whites are strong in the market now. Stove plate and agricultural scrap are wanted, and the chances are that there may be an improvement noted in the prices that will be paid for some of these latter lines.



## ONE DEALER DISPOSED OF THIRTY USED LATHES INSIDE OF A WEEK

Special to CANADIAN MACHINERY.

NEW YORK, Oct. 30, 1919.—Pending and threatened labor troubles have not had much effect upon machine-tool trade. Some sellers, however, note a slight falling off in inquiries during the past week. The bituminous coal strike, called for Nov. 1, if not prevented by the Government, will result in the closing down of many industrial plants, and it is to be expected that this will cause some hesitation in buying. The best deliveries that can be obtained on many lines of machine tools are from two to four months, so a considerable part of present business is being placed so as to insure delivery at a time when industrial skies presumably will have cleared.

The General Electric Co. has bought considerable new equipment for its Lynn, Mass., plant and is about to close on about tools for its Schenectady works. A new list will be issued by this company soon covering complete equipment for a new shop at Schenectady. The E. W. Bliss Co., Brooklyn, N.Y., manufacturer of presses and other sheet metal working tools, has been a large buyer, its purchases totalling from \$300,000 to \$400,000. Among its requirements were about 15 heavy planers, also slotters, boring mills, etc. One large planer cost \$40,000. The American Car & Foundry Co. is in the market for a con-

siderable amount of equipment for its various plants. Purchases are being made from the company's New York office. The New Departure Mfg. Co., Bristol, Conn., a subsidiary of the General Motors Corporation, is starting to buy on a list of several hundred tools.

In the export trade comparatively little is being done. Some orders have been placed for Japan, notably for an automobile manufacturing plant in that country. European business, however, is almost at a standstill owing to the exchange situation, and exporters continue to hear of sales of German tools in Europe at prices with which American builders cannot compete. Germany derives an advantage, of course, from the low value of the mark.

Second-hand machinery business is very good, and the amount of such equipment that is being absorbed is somewhat surprising. A dealer in used machines a few days ago purchased 30 turret lathes and had disposed of them in different parts of the country within a week.

Prices have not changed within the last few weeks. Buyers now pay very little attention to price, delivery being the chief consideration. Machine-tool sellers who can make the best deliveries are, as a rule, getting the business.

## ORDERS FOR STEEL ARE PILING UP AND PREMIUMS ARE FREQUENT NOW

Special to CANADIAN MACHINERY.

PITTSBURGH, October 30.—The rate of recession of the iron and steel strike continues to be a very slow one, though it has improved a trifle in the past week or two. While production was down to about 50 per cent., taking the steel industry as a whole, at the middle of the first week of the strike, it is now, after five weeks of strike, fully 60 per cent. Gains of two or three per cent. a week, however, are very small, considering that the strike, through its own efforts, never had a chance of winning when the first week showed that it could not close more than half the industry.

There has been a theory that the strike was being kept going by hopes of intervention from Washington. If so, that hope must now be gone. The Senate committee on education and labor, which investigated the strike, concluded that the strike was almost wholly by the foreign-born, ignorant of the language of the country, and decided to urge legislation to Americanize foreigners. The labor or industrial conference, which had been urged to take up the steel strike, is disbanded. Wednesday, October 22, the labor group bolted because its resolution favoring collective bargaining was not adopted. President Wilson then asked the public group to continue the work, thus politely relieving the employers'

group from further activity, but after a couple of days the public group concluded it could do nothing, and disbanded. So far as Pittsburgh opinion is concerned, the failure of the conference created no surprise. There had been much doubt whether such a conference would get anywhere.

It is too soon to observe whether the collapse of the labor conference is going to cause the strike to crumble more rapidly. It must be remembered that labor was in rather short supply in the iron and steel industry before the strike, and even with the strike entirely over the mills are likely to be somewhat short of men. Furthermore, the strike has been causing much moving around of men, and working forces will be more or less disorganized for some time, thus restricting production. One observer estimates that even if the strike now wanes rapidly it will be six months from now before working forces are as efficient and well balanced as before the strike.

### Gains in Output

In Western Pennsylvania employment has increased somewhat in the week. Except for a few plants there are approximately as many men as needed, but taking the region as a whole production is 10 to 15 per cent. under normal. The greatest improvement at any one point

has been in the case of the Lackawanna Steel Company, in the Buffalo district, whose works were completely closed at the beginning of the strike, but which are now showing a moderately fair operation. The tonnage is not altogether in proportion to the number of men in employment, but is increasing. Other works in the Buffalo district that were affected by the strike are doing better.

The Mahoning Valley in Ohio, which comprises about 10 per cent. of the country's steel making capacity, was closed tight within the first two days of the strike. It is expected that whenever operations should be resumed in the valley, and particularly at Youngstown, the principal point, the resumption would occur through there being a general break in the strike. That, however, has not been the course. Three weeks ago one blast furnace in Youngstown resumed, but even now only a small percentage of the capacity of the valley is in operation. It is understood that in many cases the men at work are living inside the mills.

The Wheeling district remains closed tight, except for a few sheet and tin mills in Wheeling that have operated right along, and two or three plants on the outskirts of the district. It is the common belief that it is at Wheeling that the strike will hang on the longest, the district being famous for strikes and labor troubles generally. Reports from Gary and Chicago are that operations are heavier in that district, though it is very doubtful whether production there approaches 50 per cent. of normal. The whole South continues to operate normally, as does Eastern Pennsylvania.

### Steel Price Prospects

If the law of supply and demand were allowed free play it would send steel prices up. Steel was by no means plentiful before the strike, yet the mills were making approximately as much as they could, their output being between 85 and 90 per cent. of capacity, and at the rate of about 2,500,000 gross tons of finished rolled steel a month. The deficiency in output in the first month of the strike was between 1,000,000 and 1,250,000 tons, and the second month, now entered upon, promises to witness loss of by far the better part of a million tons, so that even if the strike should now recede rapidly there is indicated a deficiency of at least 2,500,000 tons, or a whole month's production, since after the men are all back at work production will not at once jump to normal. Before the strike steel prices were strong, and they are low rather high compared with commodity prices in general. The March 21 steel prices, which have remained since then as the quotable market, are 81 per cent. above the ten-year pre-war average of steel prices. The Dun and Bradstreet index numbers, of commodities in general, have advanced since March 21, and now stand at 112 per cent. and 128 per cent. respectively above their corresponding pre-war averages. Demand and supply would point to higher steel prices, and relationship



of steel to other commodities would point the same way.

From the present outlook, however, the prospect is that basis steel prices will not advance. While no formal announcement has been made, there is much reason for believing that the United States Steel Corporation is strongly opposed to there being any price advances, either during or for some time after the strike, and some of the large independents may line up on that side. The smaller mills, those that do not sell far ahead, would undoubtedly charge all they could get, and that would mean premiums on early deliveries, with prices unchanged for delivery at mill convenience.

All the indications are that demand for steel will be heavy for a long time to come. The cost of making steel is not likely to decrease materially, and is much more likely to increase. When the strike is all over the mills will consider the matter of adopting the eight-hour shift as against the present twelve-hour shift, and its adoption will probably hinge largely upon the question of its being possible to obtain the additional men needed. If that is done men will receive less pay per day but higher pay per hour and thus the wage cost of making steel will increase. With values of commodities generally so much higher, relatively, than steel prices, it is not entirely improbable that in the long run steel prices will advance. Some time in the future there will be panic and industrial depression, with men hunting jobs instead of shirking work, but practically everyone expects that time to be several years in the future, leaving time for various fluctuations to occur meanwhile.

Pig iron is strong and advancing, largely in line with its strong tone before the strike, rather than because of the strike. While the strike has closed a few merchant furnaces it has also decreased the quantity of merchant pig iron used directly or indirectly by the steel works, so that advances in pig iron are not to be ascribed wholly, or perhaps even largely, to the strike. The lake front furnaces at Chicago, Cleveland and Buffalo have been greatly affected by the strike, but few furnaces elsewhere are idle from strike.

## MONTREAL NOTES

The St. Lawrence Welding Works of Montreal are going in for the manufacture of steel tanks. They will acquire a new plant for this purpose.

The Modern Tool Company, of 1495 Notre Dame Street East, are going into the manufacture of one-ton trucks for industrial and warehouse purposes.

The Canadian Kron Scale Company, of 16 Notre Dame Street East, Montreal, has acquired a local plant where they will manufacture the Kron scales for the Canadian trade. This company has also taken over the selling agency for Eastern Canada of the Brantford computing scales. The Kron scales are almost ex-

clusively used in manufacturing plants, warehouses and factories, while the Brantford line is more suitably adapted to the retail trade. The Kron Scale Company has likewise secured the Canadian manufacturing and selling rights for the Stuebing Truck Co. of Cincinnati, Ohio. G. H. Smith is the Canadian secretary.

Chas. Crawford, of Crawford and Co., chain manufacturers of Walsall, England, has been in Canada during the past week or so, visiting Montreal and Toronto, with the object of studying the field with a view of developing trade in this country.

It is announced that the Dominion Steel Corporation will shortly undertake the development of new submarine coal areas on the north side of Sydney Harbor, the headquarters of the mine to be at Bonar Point. The work is part of the plan necessary to supply a high grade metallurgical coal that will be required to manufacture the steel produced at the new steel plate mill, and also contemplate shipbuilding developments. The necessary equipment will involve an approximate expenditure of \$2,000,000.

The arrival of ten captured German guns was a feature of last week's activity at the harbor, but the event was known to few beside the officers in charge of the vessel and the guns. The guns were those taken by Montreal units, and will be drawn through the streets during the Victory parade in honor of the Prince.

At last week's meeting of the Engineering Institute of Canada, a paper entitled "Grain Dust Explosions; Their Cause and Prevention," was read by J. A. Jamieson, M.E.I.C., M.A., Soc. C.E., who was the designer of the Port Colborne elevator, which was the scene of a serious explosion some time ago. In the opinion of the speaker, the cause of the accident was the choking of one of the lofters. The author of the paper went into the matter very thoroughly and discussed the technical points involved in the cause of dust explosions. A discussion of this paper will be conducted at this week's meeting of the society.

Mr. J. F. Paige, general manager of the Port Arthur Shipbuilding Company, is leaving there shortly to take charge of the Halifax Shipyards. Mr. Paige has had a very broad experience in the shipbuilding and marine engineering fields. He was formerly with the Fore River Shipbuilding Company, and while with them visited Japan and Italy in their interests, looking after the turbine installations in Japanese and Italian warships. Mr. Paige is a Canadian, having been born in Nova Scotia, in which province he served his apprenticeship. He also sailed as engineer for some years in the Dominion Atlantic Railway Company's ships.

## AUTUMN MEETING OF ELECTRICAL ENG.

Review of Work Undertaken at the Ottawa Conference—Papers Are Read

The first autumn meeting of the Toronto Section, the American Institute of Electrical Engineers, was held in the Engineers' Club, Friday, October 24. A review of the work accomplished by the National Industrial Conference held at Ottawa was presented by Mr. Frank R. Ewart, representative of the institute. The appointment of engineering delegates representing the various societies was a recognition of the engineer's status as one who, while coming into intimate contact with both the manufacturer and laborer, yet was in a position where impartial judgment and knowledge might be expected. One of the most noticeable things about the proceedings of the conference was the complete and accurate information of the labor delegates. When one of them spoke, no time was wasted in preliminary remarks, but the whole time available to the speaker was made use of in the presenting of information vital to the cause of labor. The briefs presented by those representing the manufacturing element of the community in some cases were not so well prepared, nor did they show such a familiarity with statistics and other information pertinent to labor. Mr. Ewart's further remarks had to do with the various topics of the agenda and the manner in which they were treated. In the discussion which followed, Wills McLachlan emphasized the importance of the necessity for thorough knowledge of economics on the part of both manufacturer and engineer. Both should be as familiar with the subject as was the laboring element of the community.

An interesting paper on water-turbine design was read by Mr. Adolph Eberli, hydraulic engineer, the Hydro Power Electric Commission of Ontario. Information regarding the design of this prime mover was given, and in the paper itself and in the discussion which followed, interesting facts regarding present-day developments were brought out. The Francis turbine, which is used almost universally up to high heads, is only a development, so far as its present design is concerned, of the past twenty odd years. It was formerly thought only suitable for moderate heads, but is now used everywhere, except where exceptionally high heads are encountered, as in mountainous districts. The turbines being built for the Chippewa-Queenston development are of this type.

The Black & Decker Mfg. Co., Baltimore, Md., have recently issued a very attractive and interesting catalogue on electric air compressors, portable electric drills, and electric valve grinders. Those interested in these lines can secure a copy by application to the above mentioned concern.



# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

Grey forge Pittsburgh	\$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	\$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	\$32.75 to \$35.75

## IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	\$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	.....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

## FREIGHT RATES

	Per 100 Pounds.	C.L.	L.C.L.
Pittsburgh to Following Points			
Montreal	33	45	
St. John, N.B.	41½	55	
Halifax	49	64½	
Toronto	27	39	
Guelph	27	39	
London	27	39	
Windsor	27	39	
Winnipeg	89½	135	

## METALS

	Gross	Net
Lake copper	\$25 00	\$26 25
Electro copper	24 50	26 00
Castings, copper	24 50	25 00
Tin	58 00	58 00
Spelter	10 00	10 00
Lead	7 75	7 00
Antimony	10 00	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

## PLATES

	Montreal	Toronto
Plates, ½ up	\$ 4 50	\$ 4 50
Plates, 3-16 in.	4 90	4 90

## WROUGHT PIPES

### Standard Buttwell

	Montreal	Toronto
1 in.	\$ 6 00	\$ 8 00
1½ in.	4 68	6 81
2 in.	4 68	6 81
2½ in.	6 21	7 78
3 in.	7 82	9 95
4 in.	11 56	14 71
6 in.	15 64	19 90
8 in.	18 70	23 76
10 in.	25 16	32 01
12 in.	40 37	51 19
14 in.	52 79	66 94
16 in.	67 16	84 18

	79 57	99 74
4 in.		
Standard Lapweld		
2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8 in.	1 93	2 44
8L in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

## WROUGHT NIPPLES

4" and under, 60%.	
4½" and larger 50%.	
4" and under, running thread, 30%.	
Standard couplings, 4" and under, 40%.	
4½" and larger, 20%.	

## OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds.	Montreal	Toronto
Copper, light	\$15 00	\$13 75	
Copper, crucible	18 00	18 00	
Copper, heavy	18 00	18 00	
Copper wire	18 00	18 00	
No. 1 machine composition	16 50	16 75	
New brass cuttings	13 00	10 75	
Red brass cuttings	14 50	14 75	
Yellow brass turnings	9 00	9 00	
Light brass	7 50	7 00	
Medium brass	9 00	7 75	
Scrap zinc	6 00	6 00	
Heavy lead	5 00	5 25	
Tea lead	3 75	3 50	
Aluminum	18 00	18 00	
Heavy melting steel	13 50	13 50	
Boiler plate	13 50	11 00	
Axles (wrought iron)	20 00	20 00	
Rails	14 50	13 50	
Malleable scrap	15 00	17 00	
No. 1 machine cast iron	21 00	18 00	
Pipe, wrought	10 00	5 00	
Car wheels	20 00	20 00	
Steel axles	20 00	20 00	
Mach. shop turnings	6 00	6 00	
Stove plate	15 00	13 00	
Cast boring	7 00	8 00	

## BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ¾" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ¾" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10

Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add \$0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	\$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

## MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add \$1 00
Cold pressed nuts over 1½ in.	add 2 00

## BILLETS

	Per gross ton
Bessemer billets	\$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

Wire nails	\$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ¾ in. and larger	\$7 50
Spikes, ¼ and 5-16 in.	8 00

## ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

## POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net
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No. 4—Inclinable Open Back Press.

## Consolidated Presses

represent the highest grade in quality of material, design and workmanship, and have many exclusive features which make for economy in operation, notably the three locking points in the hubs of all flywheels, giving 20 per cent. more production than any press having only two locking points in flywheel to engage clutch.

**PRESSES FOR MARKING FUSES, FOR FUSE BODIES,  
FOR BLANKING, CUPPING AND DRAWING  
CARTRIDGE CASES.**

**Also a general line of Punch and Inclinable Presses.**

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Nos. 0, 2½, 3 and 4 carried in stock at Toronto.

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TORONTO, ONTARIO

## Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

### Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

*Prices on Application—Prompt Deliveries*

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**MORROW SCREWS MORROW**

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## MISCELLANEOUS

Solder, strictly	\$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50

Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

## CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus 10 to 40	
Canadian high speed cutters	net
American	plus 40

## COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%
Discounts off new list. Warehouse price at Montreal and Toronto	

## IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15½c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

## SHEETS

	Montreal	Toronto
Sheets, black, No. 28	\$ 6 55	\$ 6 25
Sheets, black, No. 10	5 15	5 25
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright	8 50	8 00
Apollo brand, 10% oz. galvanized		
Queen's Head, 28 B.W.G.		
Fleur-de-Lis, 28 B.W.G.		
Gorbal's Best, No. 28		
Colborne Crown, No. 28		
Premier, No. 28 U.S.	7 75	
Premier, 10% oz.	8 05	
Zinc sheets	20 00	20 00

## PROOF COIL CHAIN

Warehouse Price

B

¼ in., \$13.00; 5-16, \$11.00; ¾ in.,

\$10.00; 7-16 in., \$9.80; ¾ in., \$9.75; ¾ in., \$9.20; ¾ in., \$9.30; ¾ in., \$9.50; 1 in., \$9.10; Extra for B.B. Chain, \$1.20; Extra for B.B.B. Chain, \$1.80.

## ELECTRIC WELD COIL CHAIN B.B.

¾ in., \$16.75; 3-16 in., \$15.40; ¾ in., \$13.00; 5-16 in., \$11.00; ¾ in., \$10.00; 7-16 in., \$9.80; ¾ in., \$9.75; ¾ in., \$9.50; ¾ in., \$9.30.

Prices per 100 lbs.

## FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

## BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	\$27 00	\$ . . . .
1¼ in.	29 00	26 00
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	41 00	41 00
3¾ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

## OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	06
Lard oil, per gal.	\$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

## BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

## TAPES

Chesterman Metallic, 50 ft.	\$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

## PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

## ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

## BRASS—Warehouse Price

Brass rods, base ¼ in. to 1 in. rod 0 34

Brass sheets, 24 gauge and heavier, base \$0 42  
Brass tubing, seamless 0 46  
Copper tubing, seamless 0 48

## WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

## Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

## Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

## Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

## RUBBER BELTING

Standard ... 10% Best grades... 15%

## ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

## COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	\$42 50	\$43 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

## LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	\$10 25	\$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50
Cut sheets, ½c per lb. extra.		
Cut sheets to size, 1c per lb. extra.		

## PLATING CHEMICALS

Acid, boracic	\$ .25
Acid, hydrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulphuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy.	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.16
Nickel carbonate	.32
Nickel sulphate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated



# GEOMETRIC

## Adjustable Collapsing Taps

Have overcome all the expense and annoyance of tapping screw threads with a solid tap.

Anyone doing thread tapping knows what backing out a solid tap each time means. It usually means low production, poor threads, and worn out taps.

The mechanism of the Geometric Taps takes care of adjustment to correct diameter each time a thread is tapped, it collapses the chasers automatically, leaving a thread clean cut and perfect.

The chasers are readily reground, and when finally used up, are renewed at comparatively small cost, leaving the tap as efficient as when new.

The manufacturers of the Geometric line of Collapsing Taps and Self-opening Die Heads are justly proud of the distinction which is theirs:—

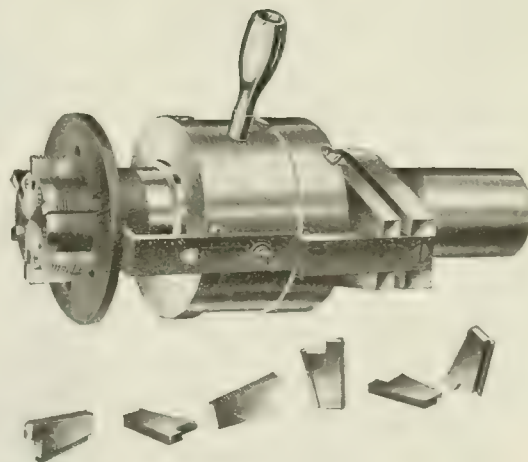
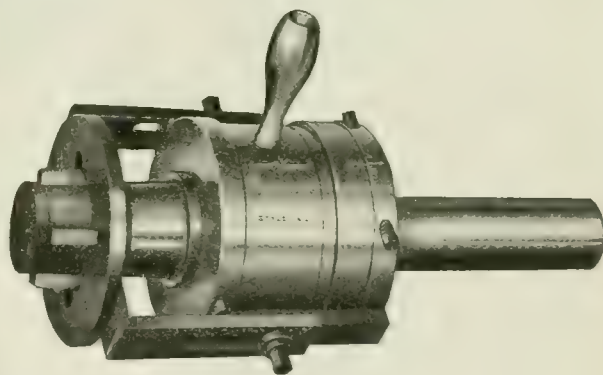
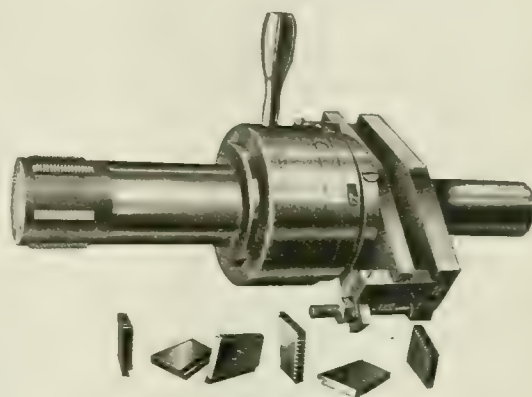
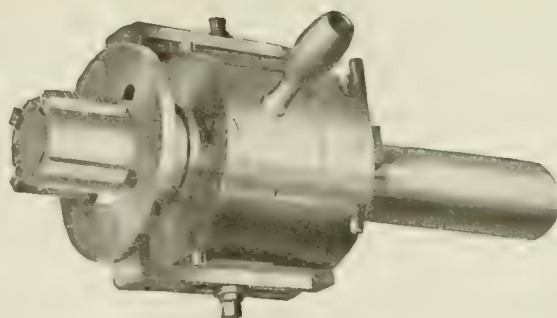
**The Originators**  
and the  
**Largest and Best Known**  
**Manufacturers**  
of  
**Automatic Threading Tools**

*For cutting all classes of screw threads, internal and external, of any diameter and form.*

**The Geometric Tool Company**  
New Haven, Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.; Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.





## RATIONS SERVED IN OLD COUNTRY

Railroad Strike, as Experienced by Former Member of CANADIAN MACHINERY Editorial Staff

A. G. Webster, formerly on the staff of CANADIAN MACHINERY, writing to this paper from Sheffield, on October 1, says:

"The threatened railway strike has become an accomplished fact, and the whole country is tied up. Conditions in Great Britain were never, perhaps, in such a chaotic state as at the present time. The strike of railway employees, including locomotive engineers and firemen, following the iron moulders' strike, has tied up the engineering industry. A few trains are running, but it has been necessary to organize motor transports to feed the population and carry mails, while motor bus services for passenger traffic have been organized by private enterprise. In this way the business of the country is being carried on. The situation is particularly serious owing to the fact that increased production is so vitally necessary for the welfare of the country, and under prevailing conditions business is almost at a standstill.

"I have heard nothing lately in regard to Canadian business in England, and less seems to have been written about American material being delivered here. The strike, however, will probably cause considerable business to leave the country. Readjustment is proceeding very slowly, and unsettled conditions will prevail for some time to come. I suppose it is a natural result of the upheaval caused by the war and is world-wide. This week we are being rationed on a war basis, 2 ounces of margarine, 30 cents' worth of meat, 2 ounces of sugar, and so on per week per head.

"I have not yet been able to secure a berth on a steamer but believe the situation is becoming easier as more troops are shipped back.

"The Government have a peculiar way of annexing a considerable portion of one's salary, and the high cost of living attends to the balance. There is thus every inducement for people to leave the country, and I believe a large number are doing so or at least as many as can get passage."

### DEEPEST WELL IN THE WORLD

The "Mining and Scientific Press" tells us that the deepest well in the world, already 7,363 feet deep, is now being drilled on the Goff farm, eight miles northeast of Clarksburg, W. Va. The drilling is still in progress, and sufficient length of cable and adequate power and tools are at hand for driving still farther into the crust of the earth. The well goes farther down than the deepest mines in Michigan, Brazil, or Europe. Several oil wells in California, in the Southwest, in West Virginia, and in Pennsylvania have exceeded 4,000 feet in depth, and one near MacDonald, Pennsylvania, fourteen miles west of Pittsburgh, reached 7,248 feet below the sur-

face. The temperature at a depth of 7,000 feet was found to be 152° F., and the rate of increase at this depth is about 1° in every 51 feet. It is estimated that the temperature of the rocks beneath the Goff well will be found at the boiling point, 212° Fahr., at a depth somewhere around 10,000 feet. The well is being drilled in search of deeper oil-sands than have been reached in this part of the basin. If the well strikes a valuable oil or gas pool, it may lead to the development of new reserves that may open up a new era in the history of the Appalachian oil and gas region.

What is said to be a record in steel production has been made by a steel mill in Lanarkshire, Scotland. Working at a cold charge capacity of 45 tons the mill produced in one week 21 charges, totalling 980 tons. The product was made into plates, rails and angles. The highest output with similar furnaces in the United States is 600 tons. The U. S. must look to its laurels.

Apropos of the League of Nations, and the universal peace which is so confidently expected by some, it is interesting to learn that Vickers, Ltd., the great English firm of shipbuilders and armament manufacturers, are shortly making new affiliations. It is said that they are about to form a partnership with the Creusot firm, with a view to estab-

lishing a Polish firm at Warsaw, to be devoted to the production of war materials. Evidently this firm at least has little faith in the dawn of the millennium.

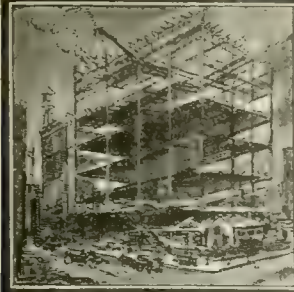
Sir Joseph Davies, K.B.E., the well-known South Wales financier, speaking at the annual meeting of Messrs. J. Samuel White & Co., Ltd., made an interesting remark. He had just returned from a visit to the United States, where he had inspected the largest yard, including that at Hog Island. His impressions were summed up in the following manner: "I should like to mention one thing in regard to America, where I have had the opportunity of seeing the new and old yards. I have come back satisfied that we can always hold our own in shipbuilding unless a great change is brought about on the other side."

**Consolidated Smelters Move to Montreal.**—The head office of the Consolidated Mining and Smelting Company will in future be located at 511 St. Catherine Street W., in the Drummond Building, Montreal. The Ontario sales office will still be kept on in the C. P. R. Building, Toronto. The company have added two new mines to their list of shipping mines recently, the Stewwinder at Greenwood and the Mountain Chief at Renata.



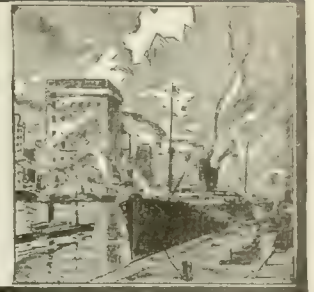
IS THERE ROOM FOR ME?





# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



### TRADE GOSSIP

**St. Thomas Gets Plant.**—It is rumored that Dodge Bros., Limited, have decided on locating a plant in St. Thomas for the manufacture of automobiles.

**New Toronto Firm.**—The incorporation is announced of the Canadian John Wood Company, Ltd., with head office in Toronto, and a capitalization of \$200,000.

**Brantford's Good Business.**—A leading Brantford industrial magnate made the statement recently that every big factory in Brantford had orders on hand to keep them working at full capacity for a considerable time to come.

**Wants Machinery.**—The St. Lawrence Welding Co., 138 Inspector St., Montreal, want a second-hand power punch and shear to work half-inch plate; also a set of power rolls, 10 ft. to 12 ft. long, to roll ½-in. plate.

**Electrification at Dominion Coal.**—The Dominion Coal Company at Glace Bay are planning to utilize all their exhaust steam to drive low pressure turbines, in turn driving generators, to supply all the power at the new mines, and future developments.

**Exporting Steel Products.**—The growth of the Armstrong, Whitworth plant at Longueuil, Quebec, near Montreal, is shown by the fact that not only are they supplying the Canadian market with steel tyres for locomotives, but are exporting their product to Australia.

**Mines Kept Idle.**—Through a shortage of cars on the Canadian National Railway the coal mines at Wayne, Rosedale and Drumheller were idle for two days. There are no domestic coal stocks on hand in Alberta, and interruption to the shipments will be attended with serious results.

**School By-law Passes.**—A by-law submitted to the ratepayers of Ingersoll for a new central school to be built at a cost of \$120,000, was passed by a majority of 395. A similar by-law presented four years ago was defeated, and the board made preparation of this one by wide advertising and a vigorous campaign.

**To Assist Loans.**—In connection with the Victory Loan in Ingersoll, the local factory employees have been organized to render assistance in the campaign. After listening to addresses from the organizers, men in ten different factories were selected to handle the work for

their own industry. A successful campaign is anticipated.

**West Wants Factories.**—Mr. T. A. Russell, president of the Toronto Exhibition, has just returned from a trip West. He says that the people of the West are anxious to have branch factories established in their provinces. They seemed as reluctant to send their money east to manufacturers there as we are to send ours to the States.

### STEEL TIRES ARE MADE IN CANADA

**Error Made in Announcing New Industry—Armstrong Whitworth Making And Exporting as Well**

In connection with the announcement in last week's CANADIAN MACHINERY of a new industrial enterprise for the manufacture of steel tires, it was stated that this was a new industry in Canada, these tires having, until now, to be imported. This was inaccurate, as the Armstrong-Whitworth of Canada, Limited, have a large plant where this work is done at Longueuil, Que. For the past eighteen months this company has been manufacturing locomotive and car wheel tires at that point, and tires of their make are from steel of their own manufacturing, and the various processes, such as forging, rolling, finishing, etc., are completed in their shops. They have supplied tires to practically every railroad in Canada with the greatest success both as to quality and workmanship, and have also shipped tires to such countries as the Dutch East Indies, Australia, South America, etc. CANADIAN MACHINERY regrets the mention of the fact that tires had to be imported, as the Armstrong-Whitworth Co. have a very large and capable organization turning out a superior product.

**New Terminal Company.**—The Havana Marine Terminals, Limited, has been incorporated at Ottawa with a capital of \$30,000,000, and headquarters at Montreal. The company has a very wide charter, including the building of graving docks and acquiring of steam and sailing ships. Gordon McDougall, K.C., is among the provisional directors.

**Brantford Factories Prepared.**—The various factories in Brantford are not worrying over the prospect of a coal

strike on November 1st in the soft coal mines of the United States. Nearly all of them have a stock of coal to last them over six months, and the schools and waterworks are likewise well supplied.

**New Industry in Hamilton.**—After negotiations stretching over a period of one and a half years, the British-American Oil Company have decided to erect an oil refining plant in Hamilton. The news was announced by Industrial Commissioner Kirkpatrick, who stated that the plant would mean an investment of \$100,000 and would be located near the Oliver Chilled Plow Works.

**Nova Scotia Miners' Demands.**—The miners in Nova Scotia have been holding meetings to determine their attitude towards wage increases. While nothing definite has been settled the feeling is that there should be a revision upwards. It is expected that the men will wait and see what action is taken by the American mine workers, and follow it up with similar action on their part.

**Fuel Commissioner's Warning.**—Mr. H. A. Harrington, Deputy Fuel Commissioner of Ontario, has made a statement that the coal situation throughout the province requires careful handling. He calls attention to the following order: "Anthracite coal of what is known as prepared sizes shall not be used by any industrial consumer for heating or power purposes except with the written consent of the Fuel Commissioner."

**Telegraph Rates To Go Up.**—The Board of Railway Commissioners are to hold a series of sittings over Canada to obtain the views of the public on the application of the telegraph companies for an increase of practically 20 per cent. on the present telegraphic rates. Sittings will be held in Ottawa on Nov. 11 and 12; Winnipeg, Nov. 15, 17 and 18; Vancouver on Nov. 22 and 24; and Victoria on the 25th November.

**To Handle Grain.**—There will be ship capacity to the amount of 15,000,000 bushels required to handle the grain at the head of Lake Superior for late loading. A large part of this grain will have to be stored in ships in Canadian ports, being too late for shipment down the lakes. It is probable that a number of American ships will be used to handle the grain, under the rates of the present agreement with the United States Food Administration.



**Toronto Firm Reorganized.**—Kerr Bros. File Works, Toronto, a long established concern, has been taken over by new interests and will in future be known as The Kerr File and Tool Company, Limited, head office at 39 Richmond Street East. A new and large building is under construction. They will be in a position to greatly increase the production of their files. For the present files only will be manufactured, but it is possible that small tool manufacturing will be started at a later date.

**Machinery Wanted.**—A new firm locating in Canada have asked the Chapman Ball Bearing Co., 347 Sorauren Ave., Toronto, to put them in touch with firms who are in a position to supply the following equipment:

1 No. 0 Brown and Sharpe Plain Milling Machine.

1 No. 2 Brown and Sharpe Plain Milling Machine.

10 No. 00 Brown and Sharpe Automatic Screw Machines.

4 No. 0 Brown and Sharpe Automatic Screw Machines.

5 No. 2 Brown and Sharpe Automatic Screw Machines.

**Patents Issued:**—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 156 Yonge Street, Toronto, from whom further particulars may be obtained: John L. H. Blackwood, button stick; Edward B. Killen, vehicle spring suspensions; Gutta Percha & Rubber, Limited, rubber mat; Fred L. Rapson, lifting jacks and the like for use on motor, road, and other vehicles; Woodington & Young, abrasive wheel; Huan A. Matear, internal spring heel seats; J. Stone & Co., Limited, valves for fluid pressure systems for operating bulkhead and like doors; Farm & Dairy Machinery Co., pneumatic valve actuating devices; Edward Manser, acid still.

**Extending Plant.**—Armstrong Bros. Tool Co., of Chicago, are making extensive additions to their plant, buildings and equipment. The new buildings include an addition to the Drop Forge department, a new building for the hardening and heat treating department, and a new reinforced concrete building for the general office, finished stock and shipping department. Building operations, which were tied up for several months by strikes, are being rushed to completion. The new buildings and equipment, together with the rearrangement of the entire plant made possible thereby, will largely increase the company's production, an increase urgently needed to take care of its rapidly growing business.

## TENDERS

The Deputy Minister of Provincial Highways is calling for tenders which must be in by November 5 for the clearing, grubbing, and all necessary work for the construction of the provincial highway in the vicinity of Ancaster. Plans and specifications will be available after October 27 at the office of the Resident

Engineer, Paris, Ont.; the City Engineer, Hamilton, and the Deputy Minister, Parliament Buildings, Toronto.

## INCORPORATIONS

The Central Electric Supply Company, Limited, has been incorporated under the Ontario Act, with a capital of \$150,000 in 1,500 shares of \$100 each. The head office will be in Toronto and the business of the company to deal in and instal electric apparatus and fixtures.

The Canadian Mexican Oil Company, Limited, has been increased under the Ontario Act with a capital of \$1,000,000, divided into one million shares of \$1 each. The head office will be in Toronto, and the company will carry on business as miners, explorers, etc.

The Ontario Tie Timber & Construction Company, Limited, has been incorporated under the Ontario Act with capital of \$550,000, divided into 3,500 shares of \$100 each. The head office to be in the town of North Bay and the company's business to deal in lumber, and carry on a general contracting business.

The E. A. Lowry Power Equipment Company, Limited, has been incorporated under the Ontario Act with a capital of \$50,000 divided into 500 shares of \$100 each. The head office will be in the city of Guelph, and the business of the company to manufacture and sell all kinds of power plant equipment.

The J. K. Carroll Construction Company, Limited, has been incorporated under a provincial charter in Ontario, with a capital of \$40,000, divided into 400 shares of \$100 each. The head office of the company will be in Kingston. The object of the company will be to deal in real estate, building operations, etc.

The T. M. Partridge Lumber Company, Limited, has been incorporated under the Ontario Companies' Act with a capital of \$100,000, divided into one thousand shares of \$100 each. The head office will be in the town of Rainy River. The company will carry on a general lumbering business.

The Canadian Oliver Chilled Plow Works, Limited, a company incorporated under the Federal Law, has been granted a license by the Ontario Government to carry on its business in Ontario, under the act respecting the licensing of extra provincial corporations. The company must not use a capital of more than \$20,000 in its Ontario business.

Other incorporations are as follows:—Farmers' Mining Company, Ltd.; Riverdale Garage, Ltd.; The Mississippi Golf Club, Ltd.; Elgin Milk Products Company, Ltd.; Food Shops, Ltd.; Allen's Russel Theatre, Ltd.; Crookston Quarries, Ltd.; Weston Flour Mills, Ltd.; K. & S. Tire & Rubber Co., Ltd.; Northern Ontario's Great Mines Development Co., Ltd. (no personal liability); Hollinger Stores, Ltd.; The Fort William Arena Company, Ltd.; John D. Ivey Co., Ltd.; McLennan's, Limited; The Guelph Arena Co., Ltd.; The Bluffs Shooting & Fish-

ing Club; Durham Securities, Ltd.; Glendale Realty, Ltd.; Cadogan Investments, Ltd.; Skead Gold Mines, Ltd. (no personal liability); The Verral Storage Company, Limited.

## MARINE

**Shipbuilding Returns.**—Lloyd's Register of Shipping gives the vessels under construction at the end of September as 5,230,000 outside of the United Kingdom, and 2,800,000 tons in the U. K. Of the vessels being built abroad, 2,584,000 tons are under Lloyd's classification.

**New Steamship Services.**—New services are being inaugurated by the Canadian Government Merchant Marine and private lines. These include services between Buenos Ayres and Monte Video and Canada, and also a service from Vancouver to the Mediterranean and Black Sea ports. These new lines will make their initial sailings in October.

**Halifax.**—Mr. Harry T. Sailor, of New York, has purchased the new four-masted schooner "Breakers," built in Yarmouth for the American Balso Company. She will be renamed the "Balso" and placed under the United States flag. Capt. Dixon, late of the United States Shipping Board, has assumed command.

**Bridgeburg.**—The crew of the ferry steamer "Orleans," owned by the International Ferry Company, quit work without any notice. They wanted an increase of pay, but the captain claims that they did not ask for it, but just quit. After some hours a new crew was shipped at the same rate of pay, and the old crew have started work at the shipyard.

**Ottawa.**—By a recent act passed by the Parliament of Great Britain, all vessels sailing from a U. K. port, under the British flag, must carry a wireless installation, and wireless operators. This will apply whether the vessel is registered in Great Britain or one of the Dominions, if the vessel is of 1,000 gross tons or over. The act will come into force three months after the expiration of the Defence of the Realm Act, by the declaration of peace.

**Montreal.**—The "War Raccoon" has arrived down from Toronto and will go into the dry-dock of the Canadian Vickers Co. before loading a cargo of lumber. She was built for the Imperial Munitions Board and is owned by Tyzack & Brantfoot, Newcastle-on-Tyne. Another new vessel in the port is the "New Toronto," built for the Elder, Dempster Line by Harland & Wolff for the Canada-South African service. She will sail about November 5.

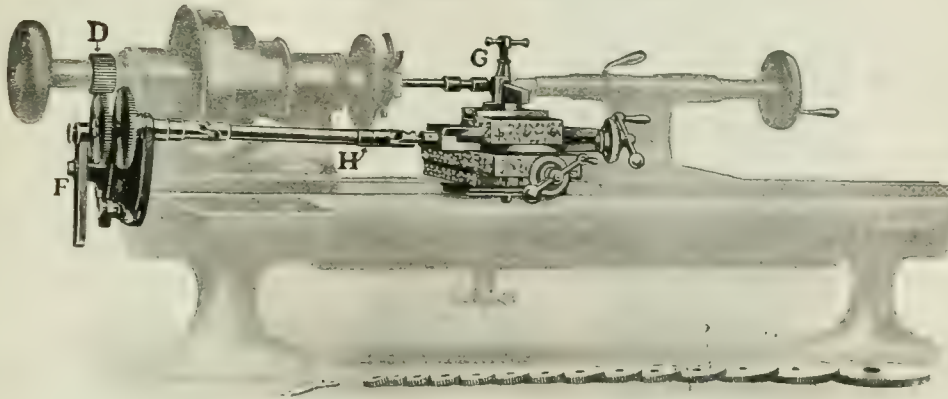
**Ocean Service Improving.**—According to Mr. A. G. Henderson of Glasgow, director of the Cunard and Anchor Steamship Lines, a great improvement would soon be noted in ocean services. Both the lines he was interested in were building new steamers rapidly, and these vessels were more commodious than their predecessors. In about one year to a year and a half the services between Canada and Great Britain and Europe would be equal, and may be superior to those of the pre-war period.



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*Write for particulars of*

The Cataract Quick Change Swing Precision Lathe for Tool Makers.

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The Cataract Precision Bench Lathes, of which there are six sizes, with full line of attachments.

The Cataract Automatic Gear Cutting Machine.

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We are always grateful for favors of this kind. It costs the reader nothing, and yet as we said before, it is of three-fold benefit.

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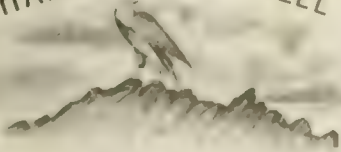
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Limited

Attention, Mr. Hocken

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Hardness, Toughness and  
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Will give twice the cut  
of a regular tool steel  
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**STEEL**  
OF EVERY DESCRIPTION  
SEND US YOUR ENQUIRIES.

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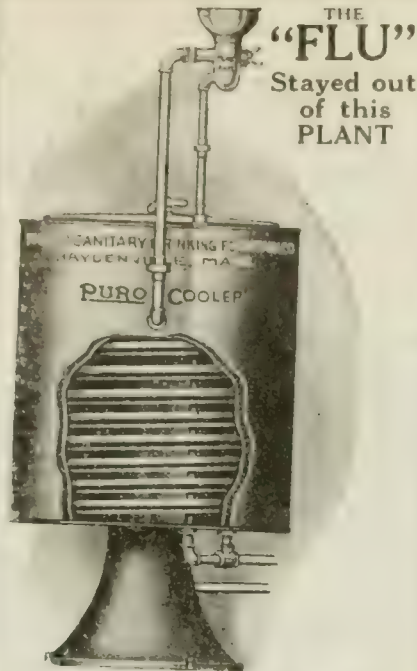
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Quick-acting, strong and simple in  
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return to us and we will refund your money. We also  
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WINNIPEG  
For All

**Machinists' Supplies**

WHEN ANSWERING ADVER-  
TISEMENTS KINDLY MENTION  
NAME OF THIS PAPER



Ottawa.—An amendment will be made to the Canada Shipping Act, enabling any Canadian registered vessel exemption from pilotage in certain waters. The amendment applies to vessels trading between British Columbia ports and San Francisco, or ports north of the latter.

## PERSONALS

The vacant treasurership of the Engineering Institute of Canada has been filled by the appointment of Sir Alexander Bertram to the office. He succeeds the late Ernest Marceau.

Mr. L. R. Brown has been appointed road engineer with the Dominion Tar & Chemical Company. Mr. Brown was formerly engineer and superintendent of the Toronto Chemical Company, Sault Ste. Marie.

W. C. J. Hocken, of the Chapman Double Ball Bearing Co., has just returned from Winnipeg, and has placed orders in Winnipeg city for the Western trade for roller bearings for Ford and Chevrolet axles, amounting to \$20,000.

Mr. R. A. Ross has been elected to the presidency of the Engineering Institute of Canada for the year 1920. Mr. Ross is City Commissioner of Montreal and chairman of the Lignite Utilization Board of Canada. Mr. Ross, who formerly had a large private practice as a consulting civil and electrical engineer, has been city commissioner for about a year and a half.

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No. 12



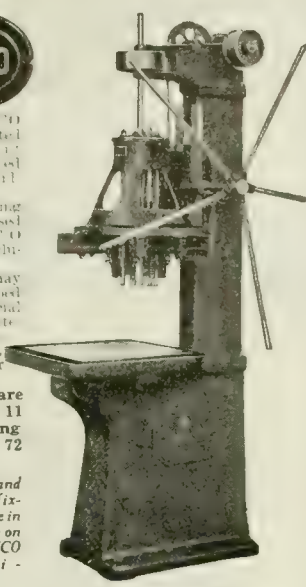
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TAP DRILLS U. S. Feet	THE LUFKIN RULE CO.
1/16" .0625	1/16" .0625
1/8" .1250	1/8" .1250
3/16" .1875	3/16" .1875
1/4" .2500	1/4" .2500
5/16" .3125	5/16" .3125
3/8" .3750	3/8" .3750
7/16" .4375	7/16" .4375
1/2" .5000	1/2" .5000
9/16" .5625	9/16" .5625
5/8" .6250	5/8" .6250
11/16" .6875	11/16" .6875
3/4" .7500	3/4" .7500
7/8" .8750	7/8" .8750
1" 1.0000	1" 1.0000

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Combining measurements 1/32nds—1/64ths together with tap drill sizes and decimal equivalents.

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TAPES AND RULES

Accurate and Durable

THE LUFKIN RULE CO. OF CANADA, LTD.  
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**WIRE SPRINGS**  
OF ALL KINDS  
Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.

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PORTABLE PLANERS  
DRAW CUT SHAPERS  
SPECIAL DRAW CUT R.R. SHAPERS  
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Special styles of all kinds to order.

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62,500 lbs...	.625"	5/8"
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46,750 lbs...	1.000"	1"
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26,000 lbs...	1.375"	1 3/8"
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2—No. 59 Toledo Crank Presses, double back geared .....	12	31	350
1—No. 57 Toledo Crank Press, double back geared .....	24	24	300
3—No. 77½ Bliss Crank Presses, double back geared .....	18	30	350
2—No. 87 Bliss Crank Presses, double back geared .....	16	27	250
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- 14" x 6' New Carroll-Jamieson Quick-Change Lathe
- 15" x 6' New Sidney D.B.G. Quick-Change Lathe, swing 17"
- 15" x 8' New Sidney D.B.G. Quick-Change Lathe, swing 17"
- 17" x 8' New National Quick-Change Lathe
- 3 17" x 8' New Sidney D.B.G. Quick-Change Lathe, swing 19"
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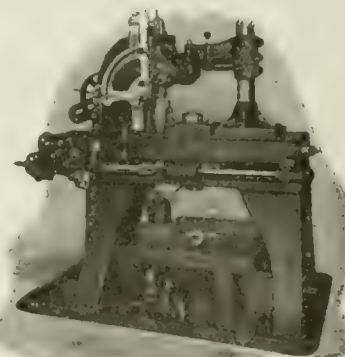
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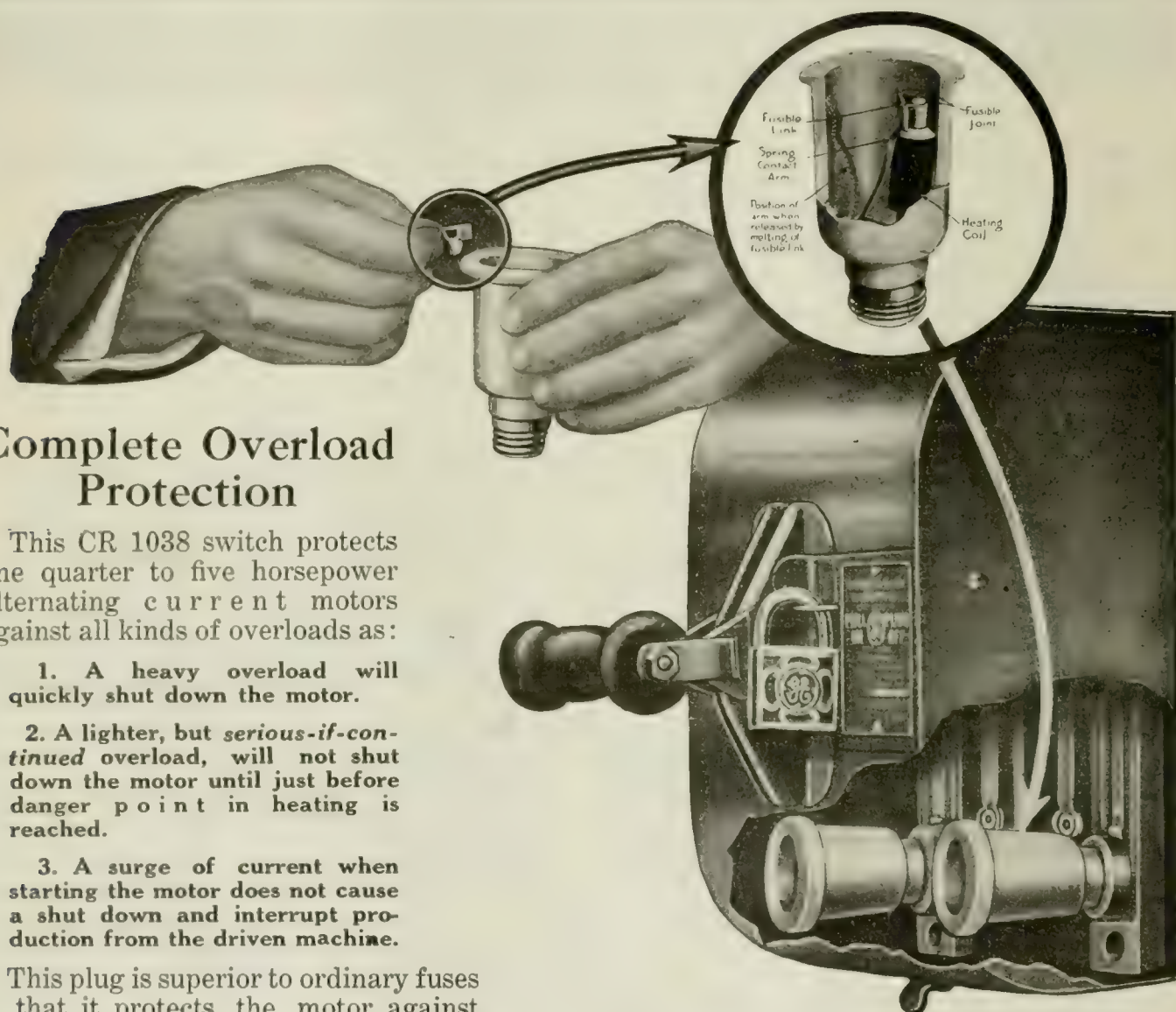
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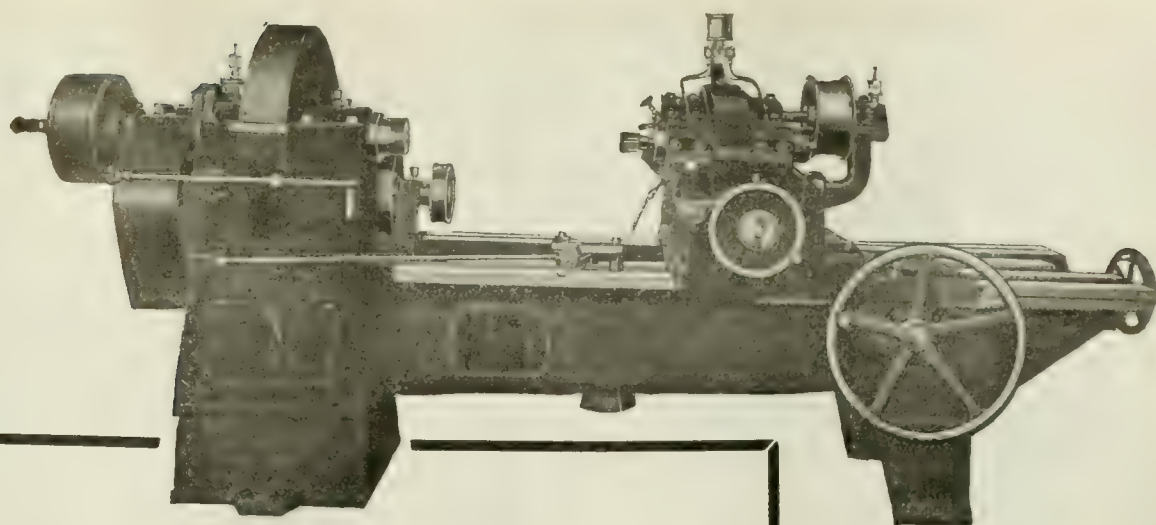
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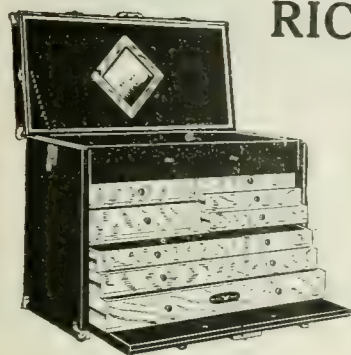
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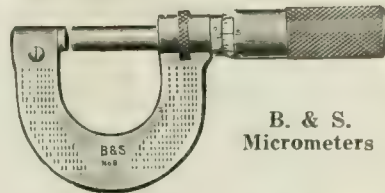
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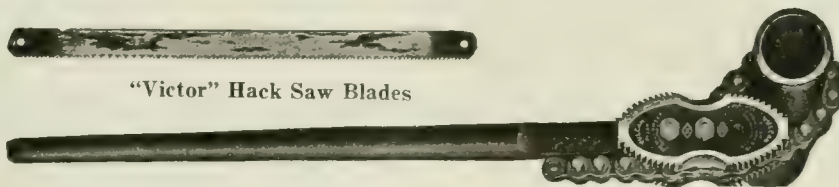
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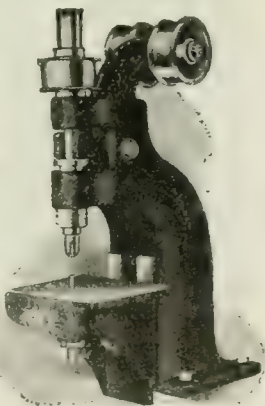
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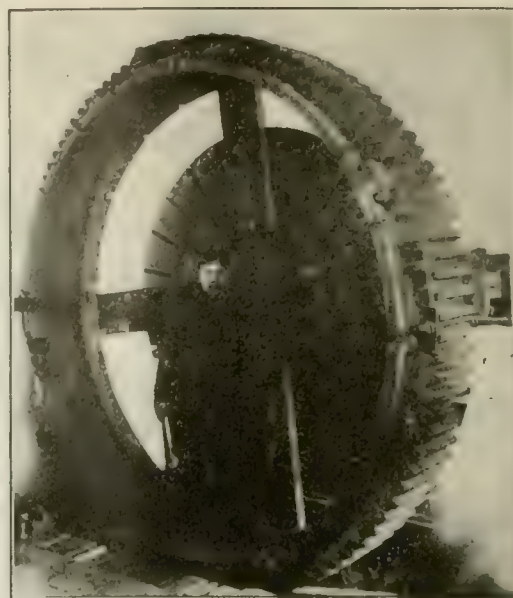
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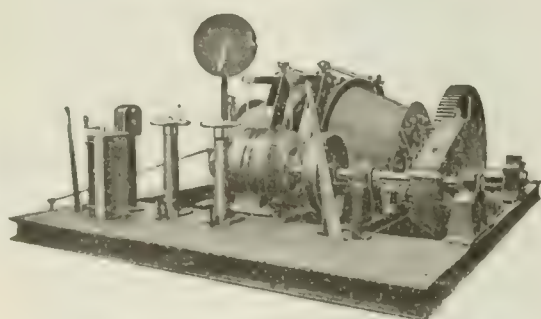
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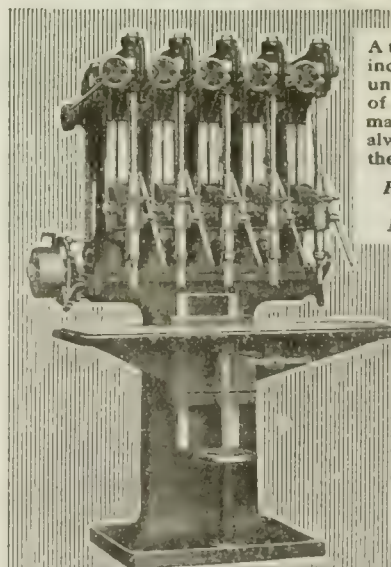
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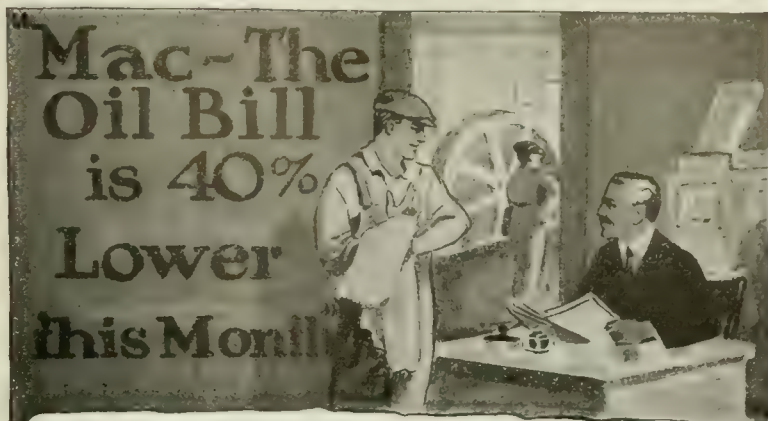
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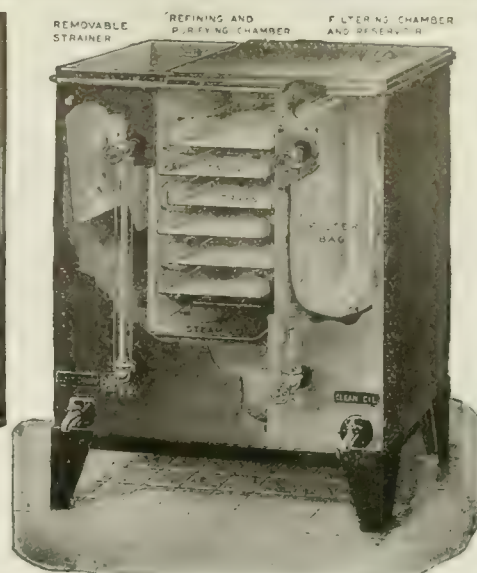
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First, means a cleaner engine room.

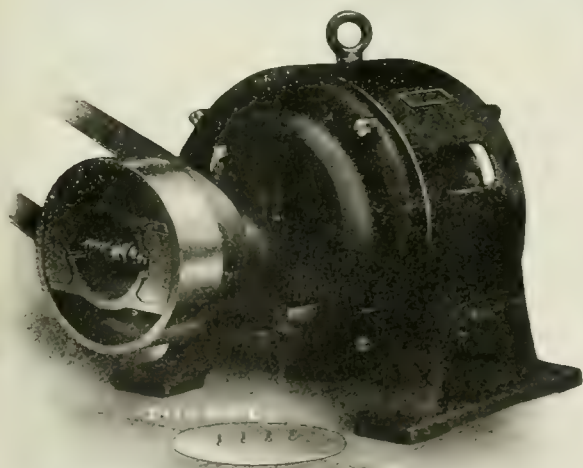
Second, it cuts your lubricating oil bill considerably.

Third, IT PAYS FOR ITSELF over and over.

# Centrifugal Friction Clutches

To Ensure the Easy Starting of A.C. & Squirrel Cage Motors

½ H.P. to 1500 H.P.



No Motor Should be Without This Simple and Unique Device.

Entirely Dispenses With all Starting Difficulties

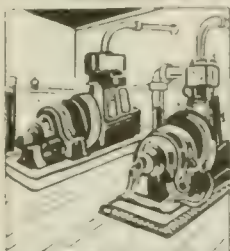
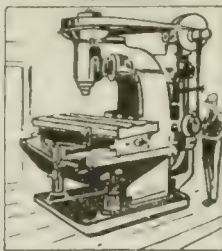
The Clutch also Effects a Great Saving in Current Consumption and Reduces the Initial Cost of Motor and Switchgear.

Please Mention Speed and H.P. of Motor When Sending Enquiries and State the Current Supply.

Write for Catalogues  
and Full Particulars

**Thomas Broadbent & Sons, Limited**  
HUDDERSFIELD, ENGLAND



**POWER HOUSE****CANADIAN MACHINERY**  
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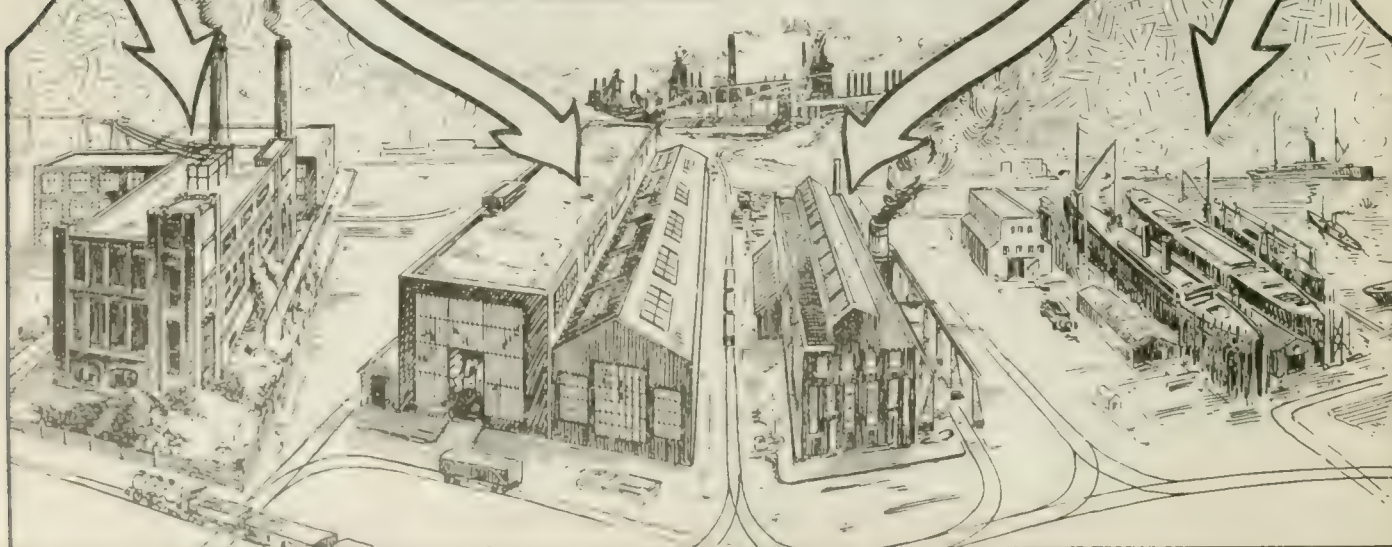
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This is where The Arrow Electric Company of Hartford, Conn., turns out blanks for electric light fixture parts and—makes records on "BLISS" Presses. When a strip of steel, brass, copper or pressed paper has clicked through, another follows it with the promptness of machine-gun delivery.

There are two special rules in the Arrow plant: first, rapid-fire production; second, "BLISS" Presses (over 100 of them). Like everything else in the plant these two rules work together mightily smoothly.

Ask for Catalogue Section No. 2-A.



1857

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1919

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No. 13

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When you want to cut  
small gears think of

**Bilton** Gear Millers  
Gear Hobbers  
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Spur  
Bevel  
Spiral  
Worm  
Small Worms

**Gears**

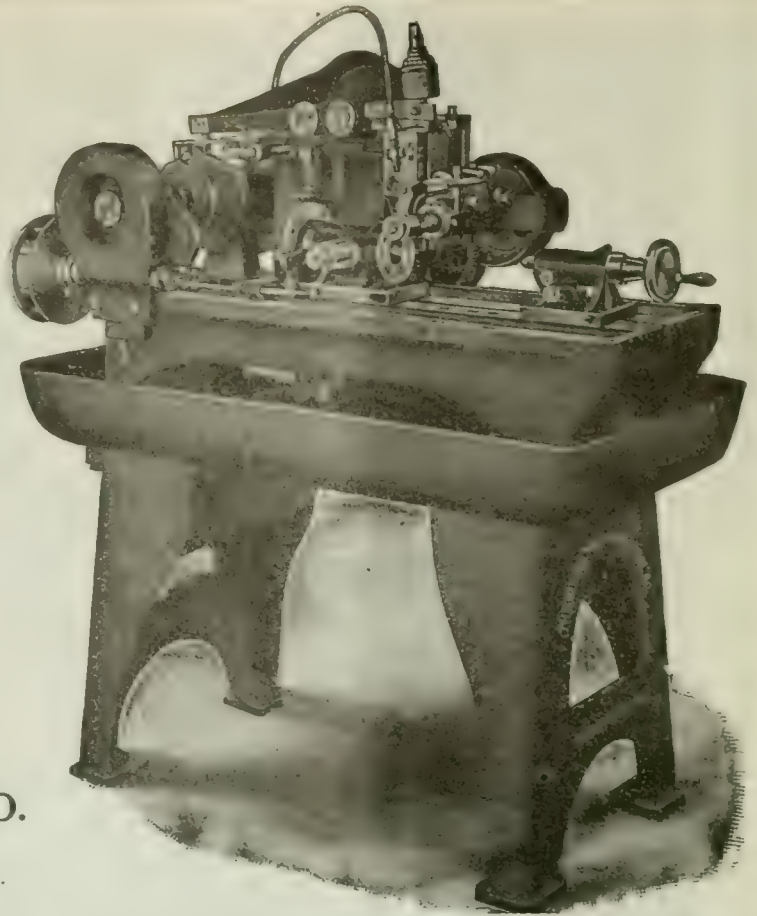
These machines have full automatic action, accurate indexing mechanism, quick releasing arbors or collets.

Let us tell you how they could handle your work.

**THE BILTON MACHINE TOOL CO.**

Housatonic Ave., Bridgeport, Conn., U.S.A.

Foreign Agents: Alfred Herbert, Ltd., Chas. Churchill and Co., Ltd.




**Manhattan  
Screw  
Presses**

**Save Time  
Boost  
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Type B

A toolmaker requires no help in handling any dies because this is a strictly one-man machine.

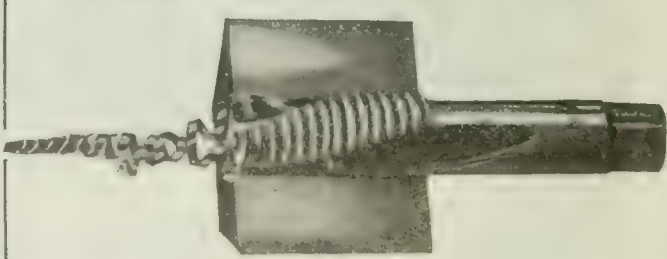
You need it because it offers value and utility in the highest degree.

Let us send full details.

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**THE "SEMPL" TAP**



(Patent Applied For)

**A SCIENTIFICALLY CORRECT  
CUTTING TOOL**

*makes tapping a pleasure*

The Most MODERN,  
The Most EFFICIENT,  
The Most ECONOMICAL.

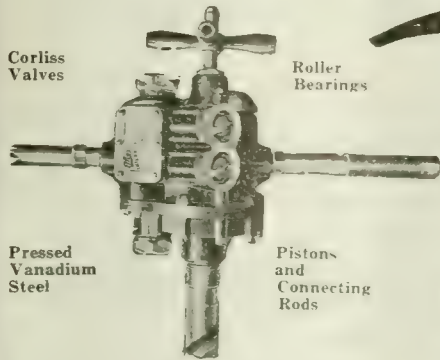
Send for a "SEMPL" Sample Tap. Made in any thread  
Special Taps for blind holes.

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## Pneumatic

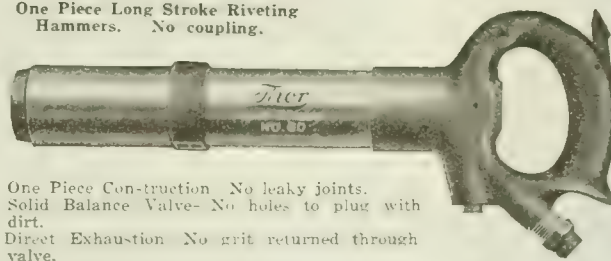
Piston Air Drills and Reamers



Four cylinder type, two on each side. Semi-Corliss valve close to each pair of cylinders gives greater efficiency and power, saves clearance losses and allows air to enter cylinder at full pressure of the pipe line.

## SPEED UP YOUR PRODUCTION AND BE PREPARED FOR THE COMING BOOM

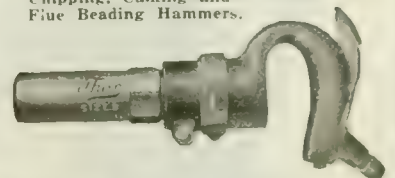
One Piece Long Stroke Riveting Hammers. No coupling.



One Piece Construction. No leaky joints. Solid Balance Valve. No holes to plug with dirt. Direct Exhaustion. No grit returned through valve.

## Tools

Chipping, Calking and Flue Beading Hammers.



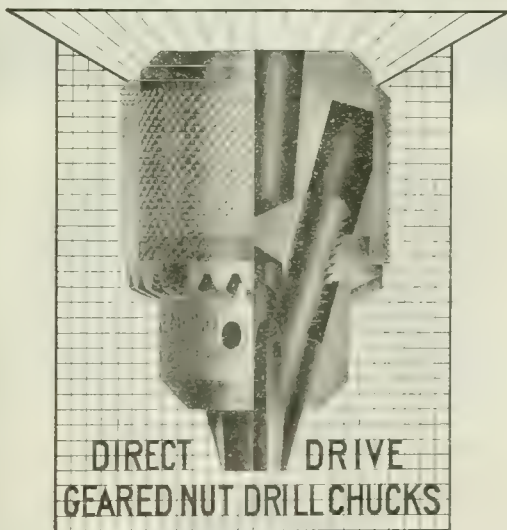
Four sizes, 1" to 4" stroke. The barrel and all wearing parts are hardened and ground, making the Thor Chipper practically free from vibration.

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CANADIAN OFFICES: 334 St. James St., MONTREAL; 32 Front St., TORONTO; 123 Bannatyne Ave. E., WINNIPEG; 1142 Homer St., VANCOUVER

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TEETH cut on the nut giving DIRECT DRIVE and the hardened steel Pinion Bushings which prevent wear, insure long life.

OTHER ALMOND PRODUCTS  
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## Die Head Cuts Perfect Threads

The H. & G. Die Head illustrated is only 3 3/8" outside diameter, yet it will cut from the smallest up to 1" standard thread and up to 1 1/8" fine threads. For absolute proof of its ability to stand up and give good results, see the perfect threads it cuts on nickel steel. You can see these many places, but in almost any automobile or aeroplane plant, for certainty.

Made in 9/16, 1", 1 1/2" and 2" sizes.

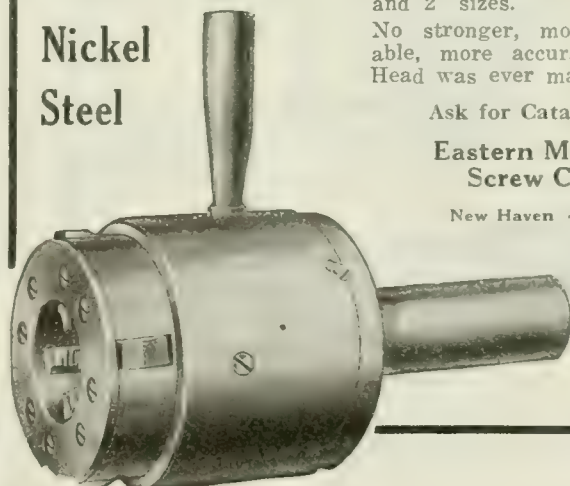
No stronger, more durable, more accurate Die Head was ever made.

Ask for Catalog

Eastern Machine Screw Corp.

New Haven - Conn.

on  
Nickel  
Steel



If interested tear out this page and place with letters to be answered.





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guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to  $\frac{1}{2}$ " thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

**Marshalltown Mfg. Co.**

Marshalltown, Iowa

U. S. A.

We wanted something original—this is what we got

**B**OTH in these operations and half another — I'll show you later — completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

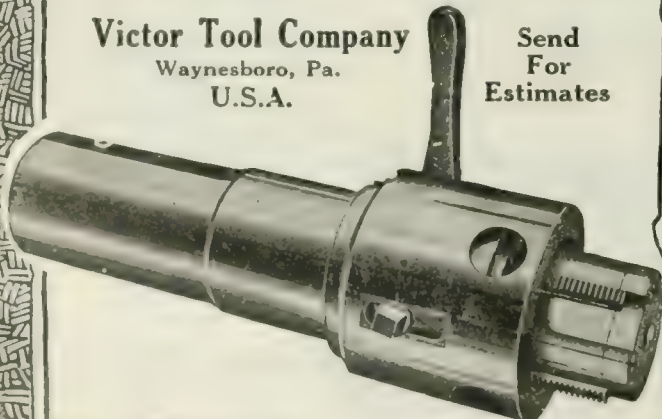
It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

**Victor Tool Company**

Waynesboro, Pa.

U.S.A.

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For  
Estimates



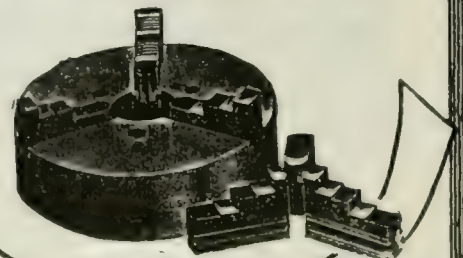
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We've been Manufacturing  
**Nothing but Chucks  
and Their Accessories**

FOR NEARLY 60 YEARS  
AND OUR PRODUCTS SHOW IT

Years of experience in using our tools has convinced manufacturers that the word "Cushman" stamped upon a chuck is a guarantee of its quality and efficiency.

Let us send you our catalogue.  
Cushman Chuck Co., Hartford, Conn., U.S.A.





# NAMCO DIES TAPS

It doesn't make a bit of difference whether it's threading screws or tapping axle housings, there's a NAMCO Threading Tool for every thread cutting requirement.

NAMCO Dies and Taps are simple in design, rigid in construction to cut threads true to specification on all classes of work.

*Ask for catalog--no obligation*

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CLEVELAND, OHIO

New England Plant - Windsor, Vt.

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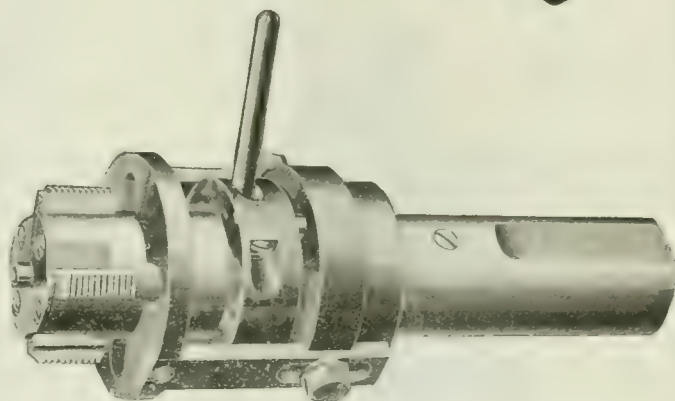
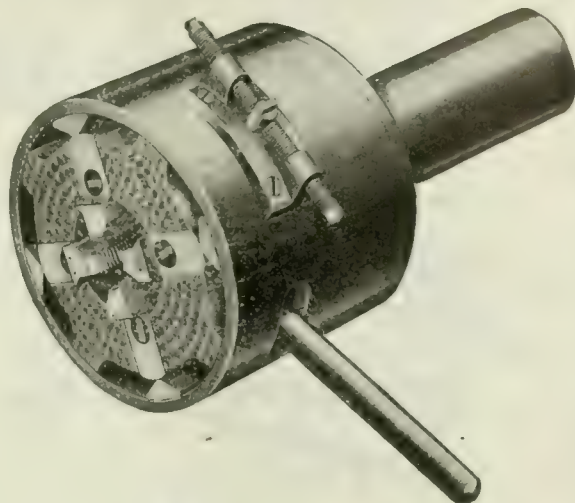
Branch Offices:

New York Boston Chicago Detroit Buffalo  
Atlanta San Francisco

Warehouses: New York and Chicago

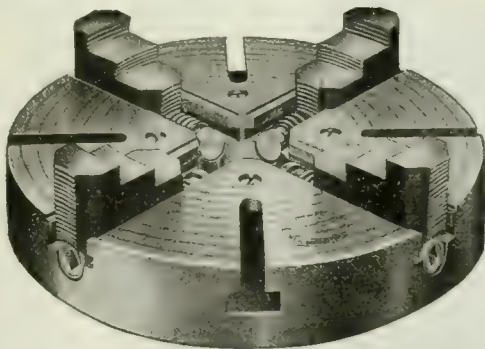
Representatives in Foreign Countries

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products, at Cleveland, Ohio



## ALL-STEEL INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



### THE UNION STEEL BODY CHUCKS

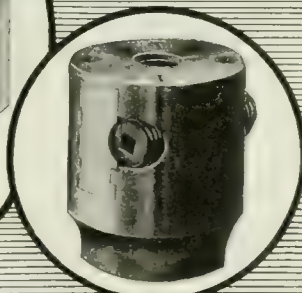
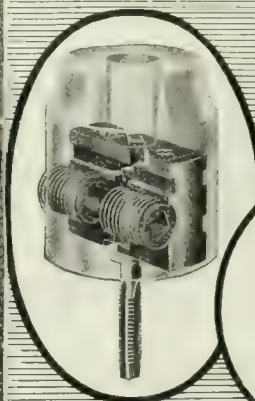
are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

**UNION MANUFACTURING COMPANY**  
New Britain, Conn.

New York Office: 26 Cortlandt Street

Makers of a complete line of chucks

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### Built For Production—Not For Price

Skinner Drill Chucks—best for accurate work. These chucks will firmly hold drills or taps accurately on centre under the most difficult and continuous operating conditions. The Jaws are correctly adjusted, tempered, hardened and accurately ground.

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New Britain, Conn.

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WHEN THINKING  
OF BELTING  
KEEP IN MIND THAT

*The back  
of the Ox*



is the part where the fibre of the hide is tightest and unaffected by the action of breathing, therefore the most suitable to produce a dead straight and practically stretchless belt.

**Tullis**  
LEATHER BELTING  
COLUMBIA BRAND

is made entirely from this portion of the hide.

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Canadian Agents:

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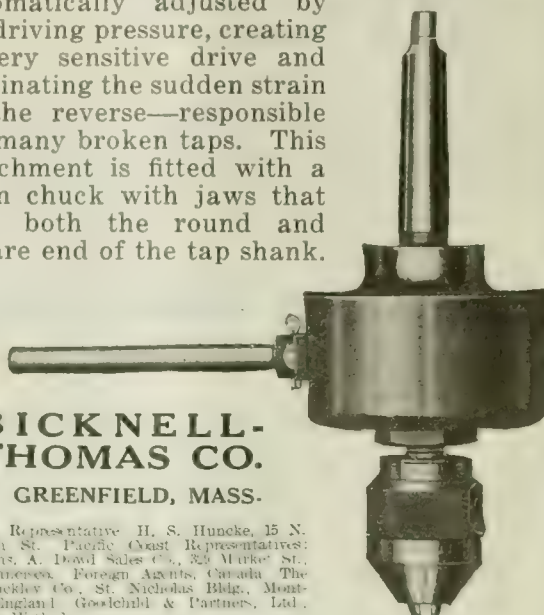
Room 25, 204 St. James Street  
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## THE BICKNELL-THOMAS TAPPING ATTACHMENT

*Fits Any Make Drill*

A friction mechanism inside the body of the attachment is automatically adjusted by the driving pressure, creating a very sensitive drive and eliminating the sudden strain of the reverse—responsible for many broken taps. This attachment is fitted with a plain chuck with jaws that grip both the round and square end of the tap shank.

Made to take  
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3-32" to 1-4"  
in diameter.



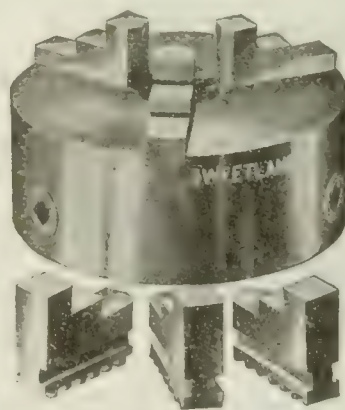
**BICKNELL-  
THOMAS CO.**

GREENFIELD, MASS.

Chicago Representative: H. S. Huncke, 15 N. Jefferson St. Pacific Coast Representatives: The Chas. A. Dowd Sales Co., 325 Market St., San Francisco. Foreign Agents: The Jap. Machinery Co., St. Nicholas Bldg., Montreuil, England. Gosschild & Partners, Ltd., London, W.C. 1.

## SWEETLAND CHUCKS

Here is another chuck from the "Sweetland" family. Our well-known "Geared



Scroll Chuck" with hardened jaws ground perfectly true on face and bite. This style is also made with four jaws. We also manufacture the entire family of "Sweetlands": Independent, Universal and Combination Chucks.

Think twice on your next order; then call on "Sweetland," the old reliable.

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Sold by Geo. F. Foss Machinery & Supply Co., Ltd.  
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Capacities: 2 Tons to 200 Tons

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*Also*

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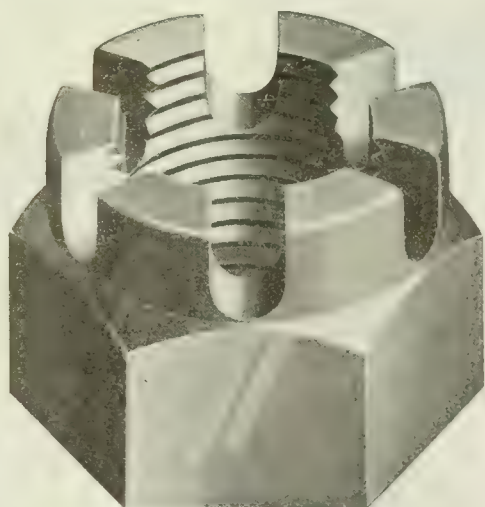
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And every one is made of high grade steel, and ground and cut for its particular purpose.

Give your men Famous Five Files to work with, and you will get good results.

Also teach them to turn in a file as soon as it becomes dull.

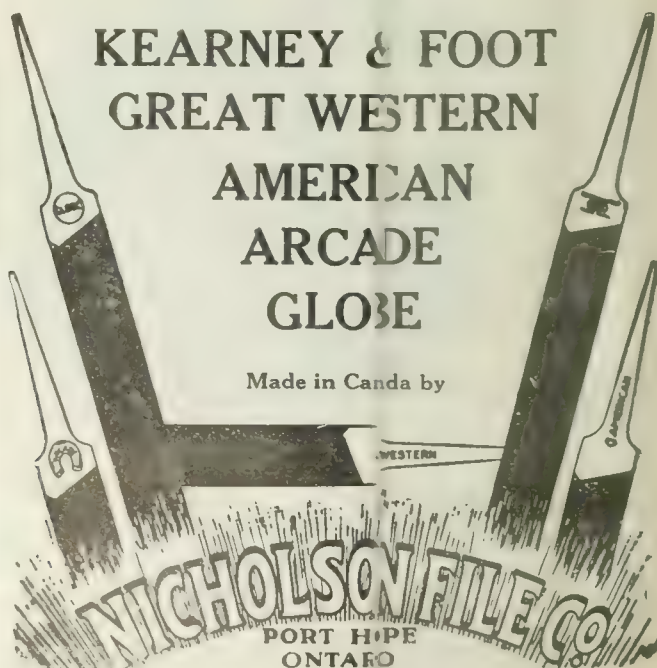
You do not need to be afraid to do this with Famous Five Files, because they will not grow dull quickly.

Specify them when ordering.

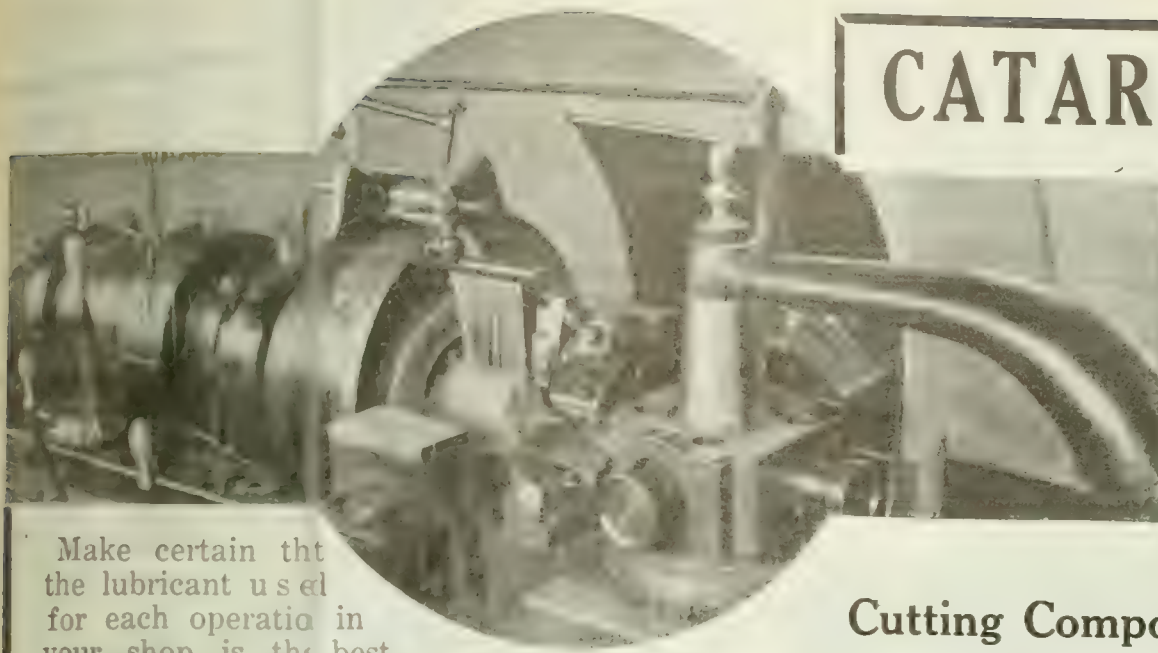
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GREAT WESTERN  
AMERICAN  
ARCADE  
GLOBE**

Made in Canada by







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SPECIAL

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**W**ILLIAMS' "Vulcan" Forged-Cutter Tool Holders give unequalled service to those who prefer the solid, forged-type of cutting tool. Each Holder, by the mere insertion of small High Speed Forged-Cutters is adapted to the heaviest service on Lathe, Planer, etc.

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Absolutely simple in construction, yet possessing all the advantages of the solid tool without its expense.

Cutters, drop-forged from the finest grade of High Speed Steel, in stock in a great variety of sizes and types, finished and hardened ready for use. Ask for descriptive booklet.

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## Williams' "Vulcan" Forged-Cutter Tool Holders



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*Pumps for any Service—Steam Appliances—  
Freight Elevators—Webster Vacuum  
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## Bryant Chucking Grinder Company

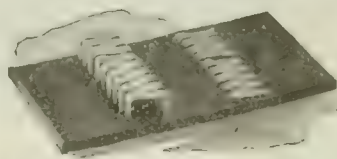
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Builders of

**Hole, Hole and Face and Deep  
Hole Grinders**

## PRESSES and SHEARS

Sheet Metal Working Machinery  
**THE D. H. STOLL CO., INC.**  
26 Lansing St., BUFFALO, N.Y.



**MAXIMUM  
EFFICIENCY  
IN  
BELTLACING**

A broken belt won't hold up production long if you repair it with

**Patent Steel BRISTOL'S Belt Lacing**

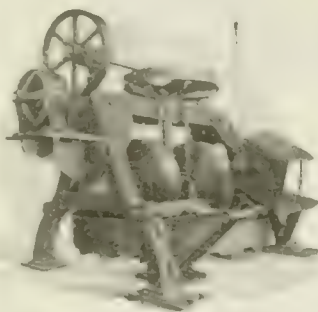
Pronounced the most efficient, because it is the easiest, the quickest and the best to apply.

No special tool is required. Simply a hammer and a soft block of wood to drive the sharp, staggered steel prongs through the belt in double rows and to clinch the points. The belt is gripped firmly without danger of cutting or weakening.

Send for samples and Catalog I-707.

**THE BRISTOL CO., Waterbury, Conn.**

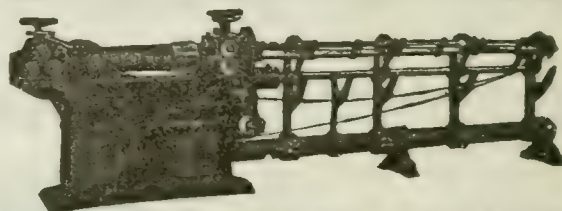
## Canadian Steel Foundries Need Frost Improved Sand Mills



### WINNING FEATURES

Heavy Mullers  
Unloading Device  
Motor or Belt Drive

**The Frost Mfg. Co.**  
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and cut to accurate lengths when it comes from our **AUTO-MATIC WIRE STRAIGHTENING AND CUTTING MACHINE**, whether it's  $\frac{3}{4}$ " diameter or only .020" wire, hard or soft wire, lightly polished or rough stock.

May we send you catalogue C?

**The F. B. SHUSTER COMPANY, New Haven, Conn.**

Formerly John Adt & Son. Established 1866.  
Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.



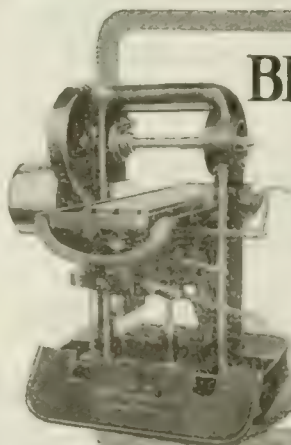
Trade Mark Reg. U. S. Pat. Office

A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.

Catalog No. 6.

**Greenfield Machine Co.**

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This Miller is breaking production records wherever introduced. It handles work no other machine of its size can touch and it does perfectly accurate work. Rigid, powerful, accurate.

We should like to show how "Briggs" adaptability and convenience can better output and lower costs for you. Get in touch with us.

**Gooley & Edlund, Inc.**  
CORTLAND, N.Y.

Canadian Representatives:  
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Press Attachments, Automatic.  
Metal and Wire Forming Machines.  
Tumblers—Large Line.  
Burnishing Machines. Grinders.  
Special Machines.

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A big, powerful, well proportioned lathe that will stand up under the heaviest service.

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Fast  
Cutting

Power-  
ful



Inserted  
Helical  
Blades  
of High  
Speed  
Steel

Will outlive and out-cut any other on the market  
4-in. Diameter for General Use.

Send for Bulletin R-P and 30-day trial offer.

**THE TABOR MANUFACTURING COMPANY**  
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Speed  
in  
Cutting  
Off

**Hurlbut, Rogers**

**Cutting-Off & Centering Machine**

TWO CUTS AT ONCE—one up, the other down. This is what makes the Hurlbut, Rogers Cutting-Off and Centering Machine virtually double the output and reduce the cost per piece one-half. You should learn more about it. Write for description to-day.

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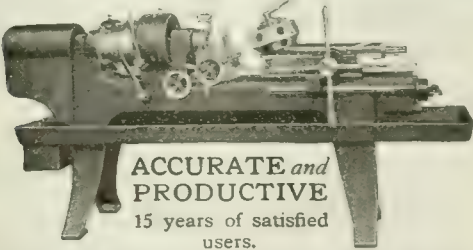
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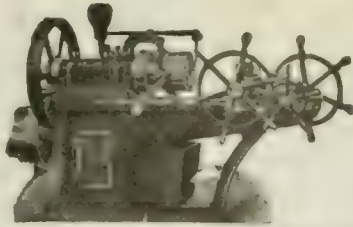
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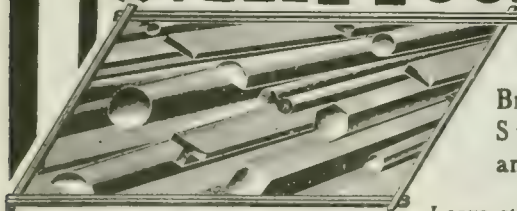
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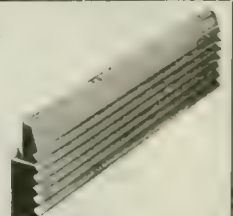
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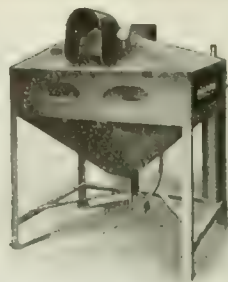


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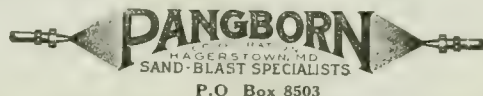


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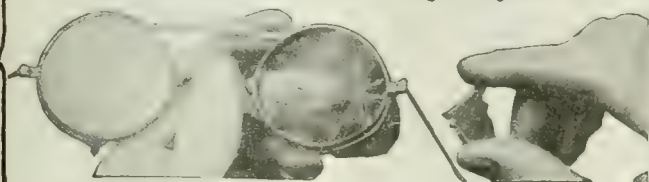
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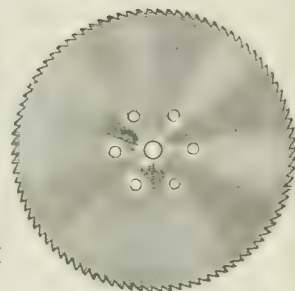
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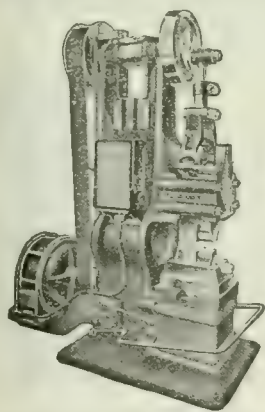
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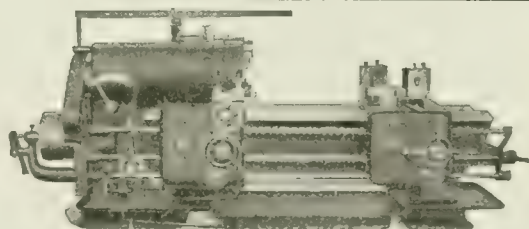
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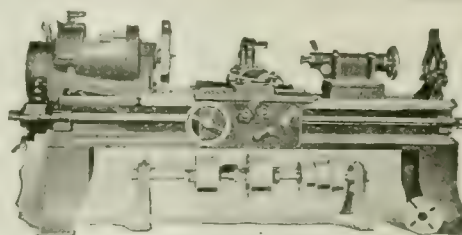
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Brown, Briggs & Co., Hamilton, Can.  
Electric Steel & Metal, Ltd., Welland.  
BRASS AND COPPER BARS, RODS  
BRAKES, CORNICES

Peck, Stow &amp; Wilcox Co., Southington, Conn.

## BRASS FOUNDERIES

Canada Metal Co., Toronto  
Greenleafs, Ltd., Belleville, Ont.  
St. Lawrence Welding Co., Montreal.  
Tallman Brass & Metal Co., Hamilton.  
Wilson & Co., J. C., Belleville, Ont.

## BRASS WORKING MACHINERY

Foster Machine Co., Elkhart, Ind.  
Garlock-Walker Machinery Co., Toronto.  
Wagner & Swasey Co., Cleveland, O.  
Niles-Bement-Pond Co., New York.  
Prest-O-Lite Co., Inc., Toronto, Ont.  
Wood Turret Machine Co., Brazil, Ind.  
Williams & Wilson, Ltd., Montreal, Que.

## BRICKS, FIRE

Harbison-Walker Refractories, Montreal.

## BRIDGES, RLY. AND HIGHWAY

Dunham Bridge Co., Montreal, Que.  
MacKinnon Steel Co., Sherbrooke, Que.

## BRONZE RODS AND SHEETS.

## PLATES

Brown's Copper & Brass Rolling Mills,  
New Toronto.

## BRONZE, NAVAL

Brown's Copper & Brass Rolling Mills,  
New Toronto.

## CANADA METAL CO., TORONTO.

Tallman Brass and Metal Co., Hamilton.

## CANADA METAL CO., TORONTO.

Buffing and Polishing Machinery

Ford Smith Mach. Co., Hamilton.  
Foss Mch. & S'ply Co., Geo. F. Montreal.  
Garlock-Walker Machinery Co., Toronto.  
Williams & Wilson, Limited, Montreal.

## BUCKETS, DUMP

MacKinnon Steel Co., Sherbrooke, Que.  
Morris Crane & Hoist Co., Herbert,  
Niagara Falls, Ont.

## BUCKETS, ELEVATOR

Can. Link-Belt Co., Toronto, Ont.  
MacKinnon Steel Co., Sherbrooke, Que.

## BUCKETS, CLAM SHELL, CRAB,

## DUMP

Can. Link-Belt Co., Toronto, Ont.  
Morris Crane & Hoist Co., Herbert,  
Niagara Falls, Ont.

## BULLDOZERS

Bertram & Sons Co., John, Dundas.  
Canada Machinery Corp., Galt, Ont.  
Garlock-Walker Machinery Co., Toronto.  
Williams & Wilson, Limited, Montreal.

## BURNERS, OIL AND NATURAL

## GAS

Northern Crane Works, Ltd., Walkerville.

## BURRS, IRON AND COPPER

Parmenter &amp; Bolloch Co., Gananoque.

## BUSHINGS, BRONZE

Morrow Screw &amp; Nut Co., John, Ingersoll.

## CALIPERS

Brown & Sharpe Mfg. Co., Providence, R. I.  
Pangborn Corporation, Hagerstown, Md.  
Peck, Stow & Wilcox Co., Southington, Conn.

## CABINETS, SAND BLAST

Pangborn Corporation, Hagerstown, Md.

## CABLE, ELECTRIC

International Machinery & Supply Co.,  
Ltd., Montreal, Que.

## CALKS, BOOT

Luffkin Rule Co., of Can., Windsor, Ont.

## CANADA SILVER SHEETS, ROLLS

Brown's Copper & Brass Rolling Mills,  
New Toronto.

## CANNERS' MACHINERY

Bliss E. W. Co., Brooklyn, N. Y.  
Brown, Briggs & Co., Hamilton, Can.

## CANNERS' CONVEYORS

Can. Link-Belt Co., Toronto, Ont.  
Wilson & Co., J. C., Belleville, Ont.

## CARBIDE

Union Carbide Co., Toronto, Ont.

## CARBONIZING BOXES

An. International Co., Ltd., Walkerville.  
Katie Foundry, Galt, Ont.  
Morris Crane & Hoist Co., L. H., Herbert,  
Niagara Falls, Ont.

## CARRIERS, PNEUMATIC TUBE

Jones &amp; Glassco, Montreal.

## CARS, INDUSTRIAL

Brown & Sharpe Co., Kitchener, Ont.  
Gray Ball Bearing Co., Ltd., Toronto.  
Gray Steel & Metal, Welland, Ont.  
M. K. Steel Co., Ltd., Southington, Que.  
Morris Crane & Hoist Co., L. H., Herbert,  
Niagara Falls, Ont.

## CASTINGS, MACHINERY

Wilson &amp; Co., J. C., Belleville, Ont.

## CASTINGS, ALUMINUM, BRASS

BRONZE, COPPER, AND GUN  
METALAlgonia Steel Corp., Sault Ste. Marie.  
Brassville Foundry Co., Brackville, Ont.  
Franklin Mfg. Co., Syracuse, N. Y.  
Greenleafs, Ltd., Belleville, Ont.

## CASTINGS, DIE CAST

Canada Metal Co., Ltd., Toronto, Ont.  
Franklin Mfg. Co., Syracuse, N. Y.

## CASTINGS, STEEL—ALL KINDS

Electric Steel & Metals Co., Welland.  
Mesta Machine Co., Pittsburgh, Pa.

## CARRIERS

## COUPLING BOLTS

John Morrow Screw & Nut Co., Ingersoll.  
Alexander Foss, Ltd., Ottawa.  
Greenleafs, Ltd., Belleville, Ont.

## CASTINGS, BENCH LEG.

Brown &amp; Sharpe Mfg. Co., Providence, R. I.

## CASTINGS, BRASS AND IRON

Algonia Steel Corp., Sault Ste. Marie.  
International Machinery and Supply Co.,  
Ltd., Montreal, Que.

## CASTINGS, BUILDING

Katie Foundry, Galt, Ont.

## CASTINGS, GRAY IRON

Bernard Industrial Co., A., Fortierville, Q.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Brown Rogers Co., Ltd., Hamilton.  
Alexander Fleck, Ltd., Ottawa.  
Gardner & Son, Robt., Montreal.  
Greenleafs, Ltd., Belleville, Ont.

## CASTINGS, HARDWARE

Hull Iron & Steel Foundries, Ltd., Hull.  
International Malleable Iron Co., Guelph.  
Kennedy & Sons, Ltd., Owen Sound.

## CASTINGS, NICHROME

Can. Driver-Harris Co., Ltd., Walkerville.

## CASTINGS, HARDWARE

Katie Foundry, Galt, Ont.

## CASTINGS, STEEL CHROME AND

## MANGANESE STEEL

Thos. Davidson Mfg. Co., Montreal, Que.  
Dom. Foundries & Steel, Hamilton, Ont.  
Hull Iron & Steel Foundries, Ltd., Hull.  
Kennedy & Sons, Ltd., Owen Sound.

## CASTINGS, MALLEABLE

International Malleable Iron Co., Guelph.

## CASTINGS, NICKEL STEEL

Hull Iron &amp; Steel Foundries, Ltd., Hull.

## CEMENT, IRON

Warrington &amp; Co., J. N., Montreal, P. Q.

## CEMENT, ELASTIC JOINTING

Warrington &amp; Co., J. N., Montreal, P. Q.

## CEMENT MACHINERY

Can. Fairbanks-Morse Co., Ltd., Montreal.  
Gardner, Robt., & Son, Montreal.

## CEMENT HANDLING MACHINERY

Can. Link-Belt Co., Toronto, Ont.

## CENTERING MACHINES

Victoria Foundry Co., Ottawa, Ont.

## CENTRE REAMERS

Bertram & Sons Co., John, Dundas.  
Bathfield & Co., Inc., Rock Island, Que.  
Gardner, Robt., & Son, Montreal.  
Hurlbut, Rogers Mch. Co., South Sud-  
bury, Mass.

## MORROW SCREW &amp; NUT CO., J., INGERSOLL, ONT.

## NILES-BEMENT-POND CO., NEW YORK.

## PRATT &amp; WHITNEY CO., DUNDAS, ONT.

## WELLS-BROOKE CO., OF CANADA, GALT, ONT.

## WHITMAN &amp; BARNES MFG. CO., AKRON, O.

## CHAIN, WELDED COIL

Morris Crane & Hoist Co., Herbert, Ni-  
agara Falls, Ont.

## CHAIN BLOCKS

Aikenhead Hardware Co., Toronto, Ont.  
Can. Fairbanks-Morse Co., Ltd., Montreal.  
Ford Chain Block & Mfg. Co., Phila., Pa.  
Garlock-Walker Mach. Co., Toronto.  
Morris Crane & Hoist Co., Herbert,  
Niagara Falls, Ont.

## RICE LEWIS &amp; SON, TORONTO, ONT.

## WILLIAMS &amp; WILSON, LTD., MONTREAL, QUE.

## JONES &amp; GLASSCO, MONTREAL, QUE.

## CHAINS, AGRICULTURAL

Morse Chain Co., Ithaca, New York.

## CHAINS, AUTOMOBILE ENGINE

Morse Chain Co., Ithaca, New York.

## CHAINS, BICYCLE, DRIVE AND

## BLOCK

Morse Chain Co., Ithaca, New York.

## CHAINS, FOR ELEVATORS AND

## CONVEYORS

Can. Link-Belt Co., Toronto, Ont.  
Morse Chain Co., Ithaca, N. Y.  
Williams & Wilson, Ltd., Montreal, Que.

## CHAIN, MALLEABLE, DETACH-

## ABLE AND RIVETED

Can. Link-Belt Co., Toronto, Ont.  
Morse Chain Co., Ithaca, N. Y.  
Williams & Wilson, Ltd., Montreal, Que.

## CHAINS, POWER TRANSMISSION

Morse Chain Co., Ithaca, N. Y.

## CHAINS, SPROCKET WHEEL

Morse Chain Co., Ithaca, N. Y.

## CHAIN DRIVES

Can. Link-Belt Co., Toronto, Ont.  
Country Chain Co., Coventry, England.  
Jones & Glassco, Montreal, Que.  
Morse Chain Co., Ithaca, N. Y.

## CHASERS

National Acme Co., Cleveland, Ohio.  
Taylor, J. A. M., 313 Star Bldg.,  
Toronto, Ont.

## CHEMISTS

Toronto Testing Laboratory, Ltd., Toronto.

## CHISELS

Whitman &amp; Barnes Co., St. Catharines.

## CHUCKS, AERO, AUTOMATIC

Garvin Machine Co., New York.

## CHUCKS, CENTERING

Hogson & Pettis Mfg. Co., New Haven,  
Conn.

## CHUCKS, COLLET, AIR

Elliott & Whitehall Mach. & Tool Co.,  
Galt, Ont.Smalley-General Co., Inc., Bay City, Mich.  
Williams & Wilson, Ltd., Montreal, Que.

## CHUCKS, DRILL, LATHE AND

## UNIVERSAL

Aikenhead Hardware Co., Toronto, Ont.  
Almond Mfg. Co., Ashburnham, Mass.  
Bicknell-Thomas Co., Greenfield, Mass.  
Bertram & Sons Co., John, Dundas.  
Can. Blower & Forge Co., Kitchener, Ont.  
Can. Fairbanks-Morse Co., Ltd., Montreal.  
Cushman Chuck Co., Hartford, Conn.  
Foss Mch. & S'ply Co., G. F., Montreal.  
Gardner, Robt., & Son, Montreal.  
Garlock-Walker Mach. Co., Toronto.  
Gisholt Machine Co., Madison, Wis.  
Hastings Bros., Inc., Chicago, Ill.  
Hogson & Pettis Mfg. Co., New Haven,  
Conn.Jacobs Mfg. Co., Hartford, Conn.  
Modern Tool Co., Erie, Pa.  
Rice Lewis & Son, Toronto, Ont.  
Skinner Chuck Co., New Britain, Conn.  
Whitton Machine Co., D. E., New  
London, Conn.

Williams &amp; Wilson, Ltd., Montreal, Que.

## CHUCKS, DRILL, AUTOMATIC

## AND KEYLESS

Aikenhead Hardware Co., Toronto, Ont.  
Bicknell-Thomas Co., Greenfield, Mass.  
Can. Blower & Forge Co., Kitchener.  
Whitton Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP

Bicknell-Thomas Co., Greenfield, Mass.  
Victor Tool Co., Weymouth, Pa.

## CHUCKS, MACHINE MILLING

Hogson & Pettis Mfg. Co., New Haven,  
Conn.

## CHUCKS, MAGNETIC

Heald Machine Co., Worcester, Mass.  
Williams & Wilson, Ltd., Montreal, Que.

## CHUCKS, RING WHEEL

Ford-Smith Mach. Co., Hamilton, Ont.  
Gardner Machine Co., Beloit, Wis.

## CHUCKS, WHEEL, CAR

Hogson & Pettis Mfg. Co., New Haven,  
Conn.

## CHUCKING MACHINES

Brown & Sharpe Mfg. Co., Providence, R. I.  
Garvin Machine Co., New York.  
Gisholt Machine Co., Madison, Wis.  
National Acme Co., Windsor, Vt.  
Niles-Bement-Pond Co., New York.  
Reedson Machine & Tool Co., Toronto.  
Warner & Swasey Co., Cleveland, O.  
Wood Turret Mach. Co., Brazil, Ind.  
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR

LUBRICATING OIL

Powell Co., Ltd., S. F., Toronto, Ont.  
Williams & Co., J. H., Brooklyn, N. Y.

## CLAMPS, BELT

Hogson & Pettis Mfg. Co., New Haven,  
Conn.

## CLEANERS, METER, WASTE,

## GENERAL

Oakley Chemical Co., New York, N. Y.

## CLEANING COMPOUND

Oakley Chemical Co., New York.

## CLOCK SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

## CLOCKS, WATCHMAN, PORTABLE

Gisholt Machine Co., Madison, Wis.  
Hastings Bros., Inc., Chicago, Ill.

## CLUTCHES, CHAIN

Wright Mfg. Co., Lisbon, Ohio.

## CLUTCHES, FRICTION AND

## PULLEY

Bernard Industrial Co., A., Fortierville, Q.  
Can. Link-Belt Co., Toronto, Ont.  
Carlyle Johnson Mach. Co., Manchester,  
Conn.Jones & Glassco, Montreal, Que.  
Williams & Wilson, Ltd., Montreal, Que.

## COAL HANDLING MACHINERY

Can. Link-Belt Co., Toronto, Ont.  
Dominion Bridge Co., Montreal, Que.  
MacGovern & Co., Montreal, Que.  
MacKinnon Steel Co., Sherbrooke, Que.  
Morris Crane & Hoist Co., Herbert,  
Niagara Falls, Ont.Northern Crane Works, Walkerville, Ont.  
Williams & Wilson, Limited, Montreal.  
Nova Scotia Steel & Coal Co., New  
Glasgow, N. S.

## COLD ROLLED STRIP, ALL METAL

## COLLARS, SHAFTING

Can. Driver-Harris Co., Ltd., Walkerville.  
Wilson & Co., J. C., Belleville, Ont.  
Williams & Co., J. H., Brooklyn, N. Y.  
Williams & Wilson, Ltd., Montreal, Que.

## COLLECTORS, PNEUMATIC

Can. Blower & Forge Co., Kitchener.  
J. C. Wilson & Co., Belleville, Ont.

## COLLETS

Becker Milling Machine Co., Boston.  
Hardinge Bros., Inc., Chicago, Ill.  
Wilson & Co., J. C., Belleville, Ont.

## COMPOSITION INGOT

Brown's Copper & Brass Rolling Mills,  
New Toronto.  
Canada Metal Co., Toronto, Ont.

## COMPOUNDS, CUTTING AND

## GRINDING, DRAWING,

## STAMPING

Oakley Chemical Co., New York, N. Y.

## COMBINED OPEN SIDE PLANNER-

## SHAPER

Lynd-Faiguhar Co., Boston, Mass.

## COMPRESSORS, AIR

Can. Ingersoll Rand Co., Sherbrooke.  
Cleveland Pneumatic Tool Co., Toronto.  
Curtis Pneumatic Mach. Co., St. Louis.  
Elliott & Whitehall Galt, Ont.  
Garlock-Walker Mach. Co., Toronto.  
Hickley Machine Co., Hickley, Ill.  
MacGovern & Co., Montreal, Que.  
Williams & Wilson, Ltd., Montreal, Que.

## CONDENSERS

MacGovern & Co., Montreal, Que.  
Smalley-General Co., Inc., Bay City,  
Mich.

## CONNECTING RODS

Canada Foundry & Forgings, Ltd., Wel-  
land, Ont.

## CONTRACT WORK

Brown Engineering Corp., Toronto.  
Ford-Smith Machine Co., Hamilton, Ont.  
Homer & Wilson, Hamilton, Ont.  
Katie Foundry, Ltd., Galt, Ont.  
Marten Machine Co., Hamilton, Ont.  
St. Lawrence Welding Co., Montreal.  
Victoria Foundry Co., Ottawa.  
Wilson & Co., J. C., Belleville, Ont.  
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC

BRAKES, ELEC. WINCHES.

MONO RAIL HOISTS

Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS

Williams Mach. Co., A. R., Toronto.

CONTROLLING INSTRUMENTS

Taylor Instrument Co., Rochester, N. Y.

CONVERTERS, ROTARY

MacGovern &amp; Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN

Can. Link-Belt Co., Toronto, Ont.  
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING

FOUNTAINS

Pure Sanitary Drinking Fountain Co.,  
Haydenville, Mass.

## COPING MACHINES

Bertram & Sons Co., John, Dundas, Ont.  
Garlock-Walker Machinery Co., Toronto.  
Niles-Bement-Pond Co., New York.  
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET,

PATES, RODS

Brown's Copper & Brass Rolling Mills,  
New Toronto, Ont.

COPPER PINS

Whitman &amp; Barnes Co., St. Catharines.

COUNTERBORES AND COUNTER-

SINKS

Aikenhead Hardware Co., Toronto, Ont.  
Blancie Co., L. C., New York City.  
Cleveland Twist Drill Co., Cleveland.  
Morse Twist Drill & Mach. Co., New  
Bedford, Mass.  
Pratt & Whitney Co., Dundas, Ont.  
Rice Lewis & Son, Toronto, Ont.  
Whitman & Barnes Mfg. Co., Akron, O.

COUNTERSHAFTS

Almond Mfg. Co., Ashburnham, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Gray Ball Bearing Co., Ltd., Toronto.  
Hail Machine Co., Bridgeport, Conn.  
Ford-Smith Machine Co., Hamilton, Ont.  
Foster Machine Co., Elkhart, Ind.  
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, FRICTION

Bernard Industrial Co., The A., Fortierville,  
Que.Can. Link-Belt Co., Toronto, Ont.  
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, RAPID HOSE

Int. Machinery & Supply Co., Ltd.,  
Montreal, Que.

COILING MACHINERY, WIRE

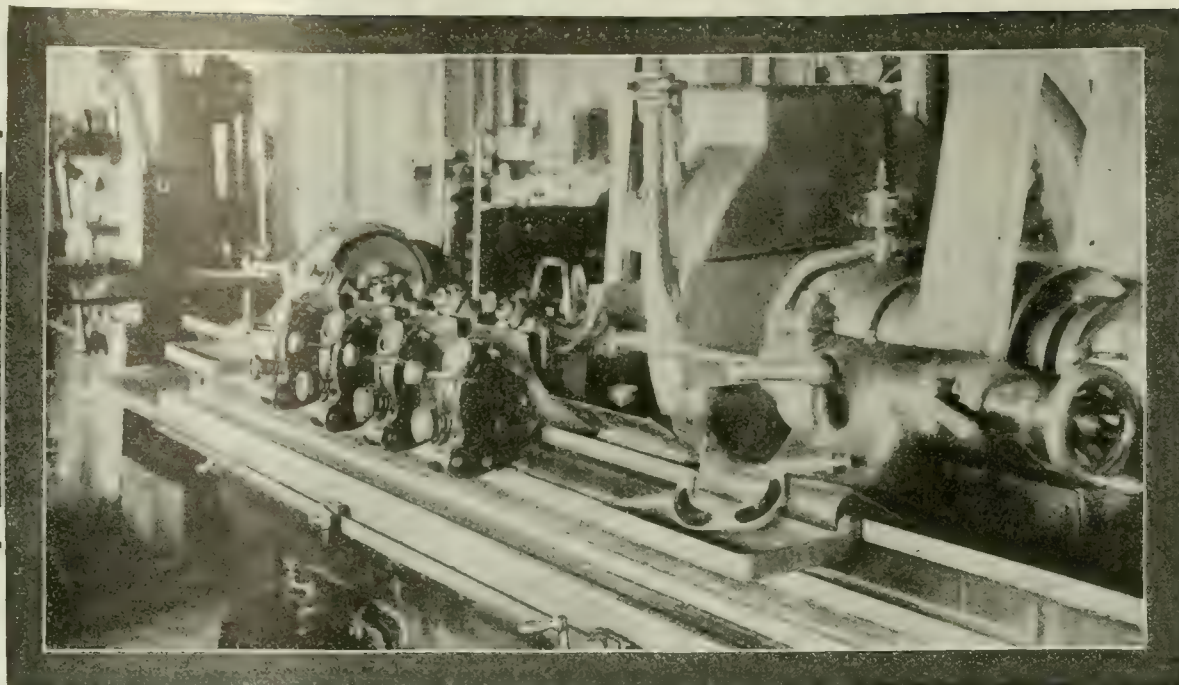
AND SPRING

Garlock-Walker Machinery Co., Toronto.

COKE AND COAL

Hanna &amp; Co., M. A., Cleveland, O.





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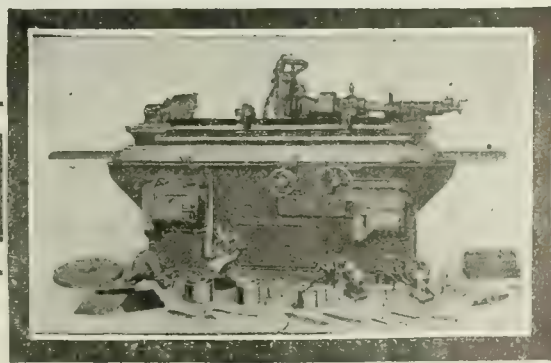
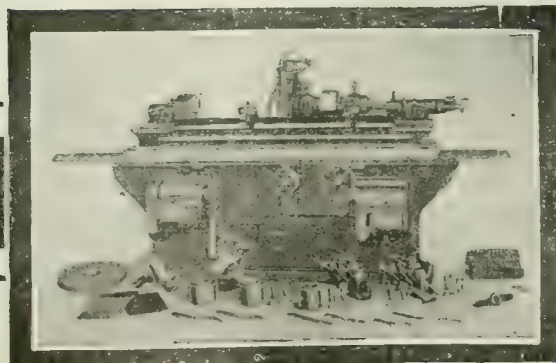
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Brown & Sharpe Grinding Machines are the fundamental working basis for this rule of the shop. Much of the important work of to-day is accomplished on these machines—by results they have demonstrated their sterling qualities and high production capacity.

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AND CUT OFF**  
Cleveland Pneumatic Tool Co., of  
Chicago, Toronto.  
Cleveland Tool Co., Montreal.  
Independent Pneumatic Tool Co., Chicago  
Wilson & Co. J. H. Bunker, Ont.

**CRANES, LOCOMOTIVE**  
Am. Locomotive Co., Toronto, Ont.  
Northern Crane Works, Walkerville.

**CRANES, OVERHEAD, HAND AND  
ELECTRIC**  
Am. Locomotive Co., Toronto, Ont.

**CUPS, OIL**  
Can. Wagon Co., Ltd., Windsor, Ont.

**COVERS, OIL HOLE**  
Can. Wagon Co., Ltd., Windsor, Ont.

**CRANES, GANTRY**  
Can. Locomotive Co., Toronto, Ont.  
Morris Crane & Hoist Co., Herbert,  
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Northern Crane Works, Walkerville.

**CRANE RUNWAYS**  
MacKinnon Steel Co., Sherbrooke, Que.

**CRANES, GOLIATH, PNEUMATIC  
AND PORTABLE**  
Morris Crane & Hoist Co., Herbert,  
Nagara Falls, Ont.  
Northern Crane Works, Walkerville.  
Wilson & Co. J. H. Bunker, Ont.  
Williams & Wilson, Ltd., Montreal, Que.

**CRANES, TRAVELLING, ELECTRIC  
AND HAND POWER**  
Can. Locomotive Co., Toronto, Ont.  
Cleveland Pneumatic Tool Co., St. Louis  
Cleveland Bridge Co., Montreal.  
Hess & Co. J. H. Bunker, Ont.  
MacKinnon Steel Co., Sherbrooke, Que.  
Morris Crane & Hoist Co., Herbert,  
Nagara Falls, Ont.  
Niles-Bement-Pond Co., New York  
Northern Crane Works, Walkerville.

**CRANK SHAFTS**  
Canada Foundry & Forgings Ltd., Welland  
Williams & Co. J. H. Bunker, N.Y.

**CRANES, PORTABLE**  
Aikenhead Hardware Co., Toronto, Ont.  
Can. Locomotive Co., Toronto.  
Morris Crane & Hoist Co., Herbert,  
Nagara Falls, Ont.  
Northern Crane Works, Walkerville.  
Rice Lewis & Son, Toronto, Ont.  
U. S. Mach. Tool Co., Cincinnati, Ohio.  
Williams & Wilson, Ltd., Montreal, Que.

**CRIMPS, LEATHER**  
Graton & Knight Mfg. Co., Worcester,  
Mass.

**CRUSHERS**  
Hess Steel & Metals, Welland, Ont.

**CUPOLAS**  
Can. Blower & Forge Co., Kitchener.  
Northern Crane Works, Walkerville.

**CURB PUMPS FOR OIL, GASOLINE**  
Barnes & Co. Ltd., S. F. Toronto, Ont.

**CURRENT TRANSFORMERS**  
Vesta Manufacturing Co., Welland, Ont.

**CUT-OFF COUPLINGS, FRICTION**  
J. H. Bunker & Co., Belleville, Ont.  
Williams & Wilson, Ltd., Montreal, Que.

**CUTTERS, BOLT**  
See Bolt Cutters.

**CUTTERS, GEARS**  
Lowry & Sons Mfg. Co., Providence, R.I.  
Fallow Gear Shaper Co., Springfield, Vt.

**CUTTERS, FLUE**  
Cleveland Pneumatic Tool Co., Toronto.

**CUTTER HEADS**  
Oliver Machine Co., Grand Rapids, Mich.

**CUTTERS, PIPE (See Pipe Cutters)**  
CUTTERS, MILLING  
Hess Milling Mach. Co., Boston, Mass.  
Butterfield & Co., Rock Island, Que.  
Hess & Co. J. H. Bunker, Ont.  
Independent Pneumatic Tool Co., Chicago.  
Lowry & Sons Mfg. Co., Providence, R.I.  
Pratt & Whitney Co., Hartford, Conn.  
Rice Lewis & Son, Toronto, Ont.  
U. S. Mach. Tool Co., Cincinnati, Ohio.  
Williams & Wilson, Ltd., Montreal, Que.

**CUTTER RELIEFING MACHINES**  
See Bolt Cutters.

**CUTTING-OFF MACHINES**  
See Bolt Cutters.

H. H. Rogers Machy Co., South  
Sudbury, Mass.  
Hess & Co. J. H. Bunker, Ont.  
Kearney & Co. Wm. Sheffield, Eng.  
Niles-Bement-Pond Co., New York, N.Y.  
Oliver Machine Co., Grand Rapids, Mich.  
Pratt & Whitney Co., Hartford, Conn.  
Rice Lewis & Son, Toronto, Ont.  
U. S. Mach. Tool Co., Cincinnati, Ohio.  
Williams & Wilson, Ltd., Montreal, Que.

**CUTTING COMPOUND AND CUT-  
TING OIL**  
Cataract Refining Co., Ltd., Toronto.

**CUTTING OIL, RECLAIMING  
SYSTEM**  
Bower Co., Ltd., S. F. Toronto, Ont.

**CUTTING AND WELDING PLANTS**  
Hess & Co. J. H. Bunker, Ont.  
Welding & Supplies Co., Montreal, Que.

**CYANIDE AND LEAD BATH POTS**  
Swedish Crucible Steel Co., Windsor.

**CYLINDERS, AIR**  
Ford-Smith Machine Co., Hamilton, Ont.  
Smalley General Co., Inc., Bay City, Mich.

**CYLINDERS, AUTOMATIC REBOR-  
ING JIGS AND REAMERS**  
Hessley Machine Co., Hockley, Ill.  
Kelley Reamer Co., Cleveland, O.

**DERRICKS**  
Aikenhead Hardware Co., Toronto, Ont.  
Dunlop Bridge Co., Montreal.  
Morris Crane & Hoist Co., Herbert,  
Nagara Falls, Ont.

**DIAMOND TOOLS**  
Ford-Smith Machine Co., Hamilton, Ont.  
Joyce Kheel Co., Inc., New York City.  
Wheel Tracing Tool Co., Windsor, Ont.

**DIAMONDS, CARBON AND BORTZ**  
Wheel Tracing Tool Co., Windsor, Ont.

**DIAMONDS, BLACK AND ROUGH**  
Joyce Kheel Co., Inc., New York City.  
Wheel Tracing Tool Co., Windsor, Ont.

**DIE BLOCKS**  
General Steel Co., Milwaukee, Wis.

**DIES, CUTTING**  
Hagson & Pettis Mfg. Co., New Haven,  
Conn.

**DIE HEADS, AUTOMATIC**  
Greenfield Tap & Die Corp., Greenfield,  
Mass.

**DIES, BRASS PRINTING, EMBOS-  
ING AND LETTERING**  
Matthews, Jaa. H. & Co., Pittsburgh, Pa.

**DIES FOR BIT BRACE USE**  
Butterfield & Co., Rock Island, Que.  
A. B. Jardine & Co., Ltd., Hespeler, Ont.  
Wells Bros. of Can., Galt, Ont.

**DIES AND DIE STOCKS**  
Aikenhead Hardware Co., Toronto, Ont.  
Atkins & Co., Ltd., Wm. Sheffield, Eng.  
Baker & Co., Inc., H. Montreal, Que.  
Butterfield & Co., Rock Island, Que.  
Brown & Rogers Co., Hamilton, Ont.  
Can. Fairbanks-Morse Co., Montreal.  
Foss Mch. & Sply Co., G. F., Montreal.  
Gardner Robt. & Son, Montreal.  
A. B. Jardine & Co., Hespeler, Ont.  
Landis Machine Co., Waynesboro, Pa.  
Marshall Son & Bunney, Toronto.  
Modern Tool Co., Erie, Pa.  
Morse Twist Drill & Mch. Co., New Bedford,  
Mass.

**DIES, METAL STAMPING**  
Hess & Co. J. H. Bunker, Ont.

**DIES, PIPE THREADING**  
A. B. Jardine & Co., Ltd., Hespeler, Ont.  
Landis Machine Co., Waynesboro, Pa.  
Williams & Wilson, Ltd., Montreal, Que.

**DIES, THREADING**  
Hess & Co. J. H. Bunker, Ont.  
Greenfield Tap & Die Corp., Greenfield,  
Mass.

**DIE SINKERS**  
Hess & Co. J. H. Bunker, Ont.

**DIES FOR MACHINES**  
Aikenhead Hardware Co., Toronto, Ont.  
Butterfield & Co., Rock Island, Que.  
Hess & Co. J. H. Bunker, Ont.  
Independent Pneumatic Tool Co., Chicago.  
Lowry & Sons Mfg. Co., Providence, R.I.  
Pratt & Whitney Co., Hartford, Conn.  
Rice Lewis & Son, Toronto, Ont.  
U. S. Mach. Tool Co., Cincinnati, Ohio.  
Williams & Wilson, Ltd., Montreal, Que.

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Mass.

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Marshall Son & Bunney, Toronto.  
Modern Tool Co., Erie, Pa.  
Morse Twist Drill & Mch. Co., New Bedford,  
Mass.

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WORK**  
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Marshall Son & Bunney, Toronto.  
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Kearney & Co. Wm. Sheffield, Eng.  
Niles-Bement-Pond Co., New York.  
Silver Mfg. Co., Salem, Ohio.  
A. B. Williams Machinery Co., Toronto.  
Williams & Wilson, Ltd., Montreal, Que.

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Modern Tool Co., Erie, Pa.  
Morse Twist Drill & Mch. Co., New Bedford,  
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Williams & Wilson, Ltd., Montreal.

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W. F. & John Barnes Co., Rockford, Ill.  
Can. Blower & Forge Co., Kitchener.  
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Foss Mch. & Sply Co., G. F., Montreal.  
Garlock-Walker Mach. Co., Toronto.  
Gavin Machine Co., New York.

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Bilton Mach. Tool Co., Bridgeport, Conn.  
Canada Machinery Corp., Galt, Ont.  
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Garlock-Walker Mach. Co., Toronto.  
Gavin Machine Co., New York.  
Hoefler Mfg. Co., Freeport, Ill.  
Hess & Co. J. H. Bunker, Ont.  
A. B. Jardine & Co., Hespeler, Ont.  
Landis Machine Co., Waynesboro, Pa.  
Niles-Bement-Pond Co., New York.  
Rockford Drilling Mach. Co., Rockford, Ill.

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Garlock-Walker Mach. Co., Toronto.  
Gavin Machine Co., New York.  
Hoefler Mfg. Co., Freeport, Ill.  
Hess & Co. J. H. Bunker, Ont.  
A. B. Jardine & Co., Hespeler, Ont.  
Landis Machine Co., Waynesboro, Pa.  
Niles-Bement-Pond Co., New York.  
Rockford Drilling Mach. Co., Rockford, Ill.

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Garlock-Walker Mach. Co., Toronto.  
Gavin Machine Co., New York.  
Hoefler Mfg. Co., Freeport, Ill.  
Hess & Co. J. H. Bunker, Ont.  
A. B. Jardine & Co., Hespeler, Ont.  
Landis Machine Co., Waynesboro, Pa.  
Niles-Bement-Pond Co., New York.  
Rockford Drilling Mach. Co., Rockford, Ill.

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Can. Blower & Forge Co., Kitchener.  
Canada Machinery Corp., Galt, Ont.

Ford-Smith Machine Co., Hamilton, Ont.  
Garlock-Walker Mach. Co., Toronto, Ont.  
Hoefler Mfg. Co., Freeport, Ill.  
A. B. Jardine & Co., Hespeler, Ont.  
Landis Machine Co., Waynesboro, Pa.  
R. McDougall Co., Galt.  
Nat. Automatic Tool Co., Richmond, Ind.  
Rockford Drilling Mach. Co., Rockford, Ill.  
Niles-Bement-Pond Co., New York.  
Silver Mfg. Co., Salem, Ohio.  
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Cleveland Twist Drill Co., Cleveland.  
Geo. F. Foss Mch. & Sply Co., Montreal.  
A. B. Jardine & Co., Hespeler, Ont.  
Morrow Screw & Nut Co., John, Ingersoll.  
Morse Twist Drill & Machine Co., New  
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Independent Pneumatic Tool Co., Chicago.  
Niles-Bement-Pond Co., New York.  
Pilot Steel & Tool Co., Montreal, Que.  
Pratt & Whitney Co., Hartford, Conn.  
U. S. Mach. Tool Co., Cincinnati, Ohio.  
A. B. Williams Machinery Co., Toronto.  
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Butterfield & Co., Rock Island, Que.  
Cleveland Twist Drill Co., Cleveland.  
Canadian Fairbanks-Morse Co., Montreal.  
H. A. Drury Co., Montreal.  
Geo. F. Foss Mch. & Sply Co., Montreal.  
Marshall Son & Bunney, Toronto.  
Morrow Screw & Nut Co., John, Ingersoll.  
Morse Twist Drill & Machine Co., New  
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# Free Tool Grinding Chart

Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

*Shows at a glance  
Correct Clearance  
and Rake Angles  
for Cutting Tools*

CANADIAN MACHINERY,  
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Please send <sup>me</sup><sub>us</sub> free, one of your tool grinding charts.

Signed .....

Firm Name .....

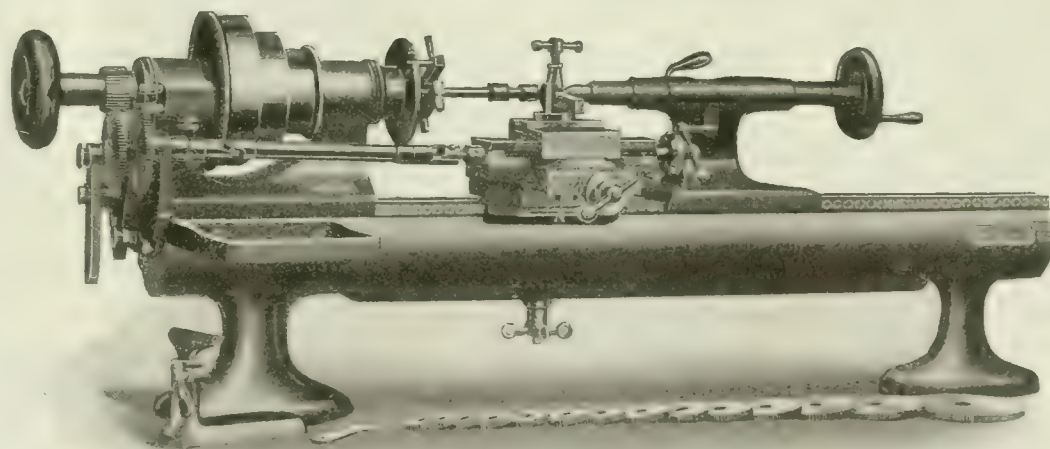
St. Address .....

City .....

Prov. ....

## CATARACT BENCH LATHES AND ATTACHMENTS

Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. Study this illustration. Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



**Hardinge Bros., 1770 Bertau Avenue, Chicago, Ill.**

ALFRED HERBERT CO., Limited, Coventry, England, are our representatives for United Kingdom, France, Belgium, Russia, Japan, Manchuria, Korea, Formosa, China, Italy.

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Cincinnati Electric Tool Co., Cincinnati.  
Cleveland Twist Drill Co., Cleveland.  
Garlock-Walker Mach. Co., Toronto, Ont.  
A. B. Jarline & Co., Hespeler, Ont.  
Morrow Saw & Nut Co., John, Ingersoll, Ont.  
Morse Twist Drill & Mach. Co., New Bedford, Mass.  
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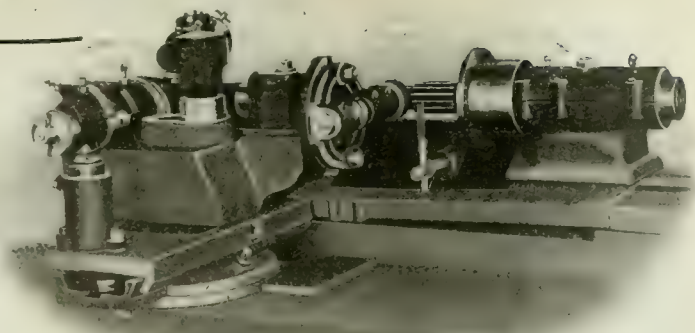
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Waynesboro, Pa.

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HAMILTON, CANADA

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Garlock-Walker Machinery Co., Toronto.  
Katie Foundry, Galt, Ont.  
Modern Tool Co., Erie, Pa.  
Morse Twist Drill & Machine Co., New Bedford.  
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Greenfield Machine Co., Greenfield, Mass.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Heald Machine Co., Worcester, Mass.  
Landis Tool Co., Westborough, Pa.  
Mendenhall Machine & Tool Co., Grand Rapids, Mich.

Norton Co., Worcester, Mass.  
Pratt & Whitney Co., Dundas, Ont.  
Wells Bros. of Canada, Galt, Ont.  
Williams & Wilson, Ltd., Montreal.

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Greenfield Tap & Die Corp., Greenfield, Mass.  
United States Elec. Tool Co., Cincinnati.  
Wells Bros. of Canada, Galt, Ont.  
Williams & Wilson, Ltd., Montreal.

**GRINDERS, CYLINDER, INTERNAL**  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Foss Mch'y. & S'ply Co., G. F., Montreal.  
Greenfield Machine Co., Greenfield, Mass.  
Heald Machine Co., Worcester, Mass.  
Landis Tool Co., Westborough, Pa.  
Modern Tool Co., Erie, Pa.

Norton Co., Worcester, Mass.  
Williams & Wilson, Ltd., Montreal.

**GRINDERS, PORTABLE, ELECTRIC, HAND, TOOL POST, FLOOR AND BENCH**  
Baird Machine Co., Bridgeport, Conn.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Cincinnati Electrical Tool Co., Cincinnati.  
Ford-Smith Mach. Co., Hamilton, Ont.  
Worcester Electric Co., Inc., Racine, Wis.  
Foss Mch'y. & S'ply Co., G. F., Montreal.  
Grant Mfg. & Mach. Co., Bridgeport, Conn.  
Garlock-Walker Machinery Co., Toronto.  
Greenfield Machine Co., Greenfield, Mass.

Independent Pneumatic Tool Co., Chicago.  
United States Elec. Tool Co., Cincinnati.  
Williams Machy Co., A. R., Toronto.  
Williams & Wilson, Ltd., Montreal.  
Wilkinson & Kompas, Hamilton, Ont.

**GRINDERS, MANUFACTURING**  
Universal Grinding Mach. Co., Fitchburg, Mass.

**GRINDERS, HOLE, HOLE AND FACE AND DEEP HOLE**  
Bryant Chucking Grinder Co., Springfield, Vermont.

Heald Machine Co., Worcester, Mass.  
**GRINDERS, PLAIN CYLINDRICAL**  
Fitzsimons Grinding Mach. Co., Fitchburg, Mass.

**GRINDERS, PNEUMATIC**  
Can. Ingersoll-Rand Co., Montreal.  
Cleveland Pneumatic Tool Co., Toronto.  
Garlock-Walker Machinery Co., Toronto.  
Heald Machine Co., Worcester, Mass.  
Independent Pneumatic Tool Co., Chicago.  
MacGowan & Co., Montreal, Que.

**GRINDERS, PROFILE**  
Cleveland Pneumatic Tool Co., Cleveland, Ohio.

**GRINDERS, ROTARY SURFACE**  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Bristol Machine Tool Co., Bristol, Conn.  
Mendenhall Machine & Tool Co., Grand Rapids, Mich.

**GRINDERS, TOOL AND HOLDER**  
Armstrong Bros. Tool Co., Chicago.  
W. F. & John Barnes Co., Bedford, Ill.  
Blount & Co., J. G., Everett, Mass.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Ford-Smith Mach. Co., Hamilton, Ont.  
Greenfield Machine Co., Greenfield, Mass.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Acme Co., Cleveland, Ohio.

Taylor Mfg. Co., Philadelphia, Pa.  
Wells Bros. of Canada, Galt, Ont.

**GRINDERS, UNIVERSAL, PLAIN**  
Mendenhall Machine & Tool Co., Grand Rapids, Mich.  
Modern Tool Co., Erie, Pa.

Norton Co., Worcester, Mass.  
Williams & Wilson, Ltd., Montreal.

**GRINDERS, VERTICAL, SURFACE**  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Can. Ingersoll-Rand Co., Montreal.  
Heald Machine Co., Worcester, Mass.  
Pratt & Whitney Co., Dundas, Ont.  
Gisholt Machine Co., Madison, Wis.

Norton Co., Worcester, Mass.  
Williams & Wilson, Ltd., Montreal.

**GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME**  
Can. Fairbanks-Morse Co., Montreal.  
Cincinnati Elec. Tool Co., Cincinnati, O.  
Ford-Smith Mach. Co., Hamilton, Ont.  
Garvin & Son, Robt., Montreal.  
Garvin Machine Co., New York.  
Garlock-Walker Machinery Co., Toronto.  
Greenfield Machine Co., Greenfield, Mass.  
Hall & Sons, John H., Brantford, Ont.  
LeBlond Mch. Tool Co., R. K., Cincinnati.  
Niles-Bement-Pond Co., New York, N.Y.

Norton Co., Worcester, Mass.  
Wisconsin Electric Co., Racine, Wis.  
Williams & Wilson, Ltd., Montreal.

**GRINDING MACHINES, CAR WHEEL, CUTTER, CYLINDRICAL, CRANKSHAFT**  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Norton Co., Worcester, Mass.

**GRINDING WHEELS**  
Aikenhead Hardware Co., Toronto, Ont.  
Brantford Emery Wheel Co., Brantford, Ont.  
Can. Fairbanks-Morse Co., Montreal.  
Ford-Smith Machine Co., Hamilton, Ont.  
Foss Mch'y. & S'ply Co., G. F., Montreal.  
Norton Co., Worcester, Mass.

**GUARDS, WINDOW AND MACHINE**  
Canada Machinery Corp., Galt, Ont.  
Canada Wire & Iron Goods Co., Hamilton.  
Dennis Wire & Iron Works, London, Ont.  
Fitz Steel & Wire Co., Adrian, Mich.  
Strong, Kennard & Nutt Co., Cleveland.

**HANDLES, BALANCE, CRANK AND MACHINE**  
Williams & Co., J. H., Brooklyn, N.Y.

**GUTTERS AND SKYLIGHTS**  
H. H. Robertson Co., Ltd., Sarnia, Ont.

**HACK SAW BLADES**  
Aikenhead Hardware Co., Toronto, Ont.  
Atkins & Co., Ltd., Wm., Sheffield, Eng.  
Baker & Co., L. C., New York City.  
Baker & Co., Inc., H., Montreal, Que.  
Can. Fairbanks-Morse Co., Montreal.

Diamond Saw & Stamping Wks., Buffalo.  
Ford-Smith Machine Co., Hamilton, Ont.  
Kaysar-Ellison & Co., Ltd., Montreal.  
Marshall, Son & Bunney, Toronto.  
Norton, Ralph R., Agent, Montreal.  
Foss Mch'y. & S'ply Co., G. F., Montreal.

Erris (London), Ltd., London, England.  
Racine Tool & Machine Co., Racine, Wis.  
Pewees, Ltd., Winnipeg, Man.  
Pilot Steel & Tool Co., Montreal, Que.  
Rice Lewis & Son, Toronto, Ont.

Samuels Mfg. Co., Fitchburg, Mass.  
L. S. Starrett Co., Attle, Mass.  
Standard Machy. & Supplies, Montreal.  
Victor Saw Works, Ltd., Hamilton.  
Wilkinson & Kompas, Hamilton.

Williams & Wilson, Ltd., Montreal.

**HACK SAW FRAMES**  
Aikenhead Hardware Co., Toronto.  
Can. Fairbanks-Morse Co., Montreal.  
Ford-Smith Machine Co., Hamilton, Ont.  
Garvin Machine Co., New York City.

Victor Saw Works, Hamilton, Ont.  
Rice Lewis & Son, Toronto, Ont.  
Wilkinson & Kompas, Hamilton, Ont.

Williams & Wilson, Ltd., Montreal.

**HACK SAWS, POWER**  
Aikenhead Hardware Co., Toronto, Ont.  
Can. Fairbanks-Morse Co., Montreal.  
Diamond Saw & Stamping Wks., Buffalo.

Foss Mch'y. & S'ply Co., G. F., Montreal.  
Ford-Smith Machine Co., Hamilton.  
Peerless Machine Co., Racine, Wis.  
Racine Tool & Machine Co., Racine, Wis.

Starrett Co., L. S., Athol, Mass.  
Victor Saw Works, Hamilton, Ont.  
Williams Machy Co., A. R., Toronto.

Williams & Wilson, Ltd., Montreal.

**HAMMERS, HATCHETS**  
Wagman & Barnes Co., St. Catharines.

**HAMMERS (DROP), MOTOR AND BELT DRIVEN**  
Beardley & Co., Boston, Mass.  
Bliss Co., E. W., Brooklyn, N.Y.

Brown, Boggs Co., Ltd., Hamilton.  
Can. Ball & Spencer, Ltd., Welland.  
Canada Machinery Corp., Galt, Ont.  
High Speed Hammer Co., Rochester, N.Y.

Jacobs & Co., A. B., Hesper, Ont.  
Niles-Bement-Pond Co., New York, N.Y.  
Toledo Machine & Tool Co., Toledo.  
United Hammer Co., Boston, Mass.

Williams & Wilson, Ltd., Montreal.

**HAMMERS, HELVE POWER**  
Canada Machinery Corp., Galt, Ont.  
West Tire Setter Co., Rochester, N.Y.

Williams & Wilson, Limited, Montreal.

**HAMMERS, CHIPPING, CAULKING, PNEUMATIC**  
Can. Ingersoll-Rand Co., Montreal, Que.  
Garlock-Walker Machinery Co., Toronto.  
Independent Pneumatic Tool Co., Chicago.

**HAMMERS, MARKING**  
Matthews & Co., Jas. H., Pittsburgh, Pa.

**HAMMERS, NAIL MACHINE**  
Rice Lewis & Son, Toronto, Ont.  
United Hammer Co., Boston, Mass.

**HAMMERS, STEAM**  
Canada Machinery Corp., Galt, Ont.  
Niles-Bement-Pond Co., New York.

**HAND PLANERS**  
Oliver Mch'y. Co., Grand Rapids, Mich.

**HAND LEATHERS OR PADS**  
Graton & Knight Mfg. Co., Montreal.

**HANGERS**  
Brown & Sharpe Mfg. Co., Providence, R.I.

**HANGERS, SHAFT**  
Algoma Steel Corp., Sault Ste. Marie.  
Can. General Electric Co., Toronto, Ont.  
Chapman Double Ball Bearing Co., Toronto.  
Gray Ball Bearing Co., Ltd., Toronto.

Baird Machine Co., Bridgeport, Conn.  
Can. S. K. F. Co., Toronto, Ont.  
Garvin & Son, Robt., Montreal.  
Jones & Glasco, Montreal.  
Standard Pressed Steel Co., Philadelphia.

Williams & Wilson, Limited, Montreal.

**HARDNESS TESTING INSTRUMENTS**  
Shore Instrument & Mfg. Co., New York.

**HEAD, AUXILIARY**  
Hoefler Mfg. Co., Freeport, Ill.

**HEATING AND VENTILATING ENGINEERS**  
Can. Blower & Forge Co., Kitchener, Ont.

**HEAT TREATMENT OF STEEL**  
Gray Ball Bearing Co., Ltd., Toronto.

**HEAT GAUGES, HARDENING AND ANNEALING**  
Shore Instrument & Mfg. Co., New York.

**HELMETS, SANDBLAST, AMMONIA**  
Strong, Kennard & Nutt Co., Cleveland.

**HIGH SPEED STEEL**  
See Steel.

**HINGE MACHINERY**  
Baird Machine Co., Bridgeport, Conn.  
Illinois Tool Works, Chicago, Ill.

**HINGES**  
Jatford & Co., The Rock Island, Que.  
London Bolt & Hinge Wks., London, Ont.

**HOBS**  
Greenfield Tap & Die Co., Greenfield, Mass.  
Illinois Tool Works, Chicago, Ill.  
Pratt & Whitney Co., Dundas, Ont.  
Taylor, J. A. M., 318 Stair Bldg., Toronto.

Wells Bros. of Canada, Galt, Ont.

**HOISTS, AIR**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.  
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

**HOISTS, CHAIN AND PNEUMATIC**  
Can. Ingersoll-Rand Co., Montreal, Que.  
Garlock-Walker Machinery Co., Toronto.  
Ford Chain Block & Mfg., Philadelphia.  
Independent Pneumatic Tool Co., Chicago.  
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

Northern Crane Works, Walkerville, Ont.  
Wright Mfg. Co., Lisbon, Ohio.  
Williams & Wilson, Limited, Montreal.

**HOISTS, ELECTRICAL**  
Can. Link-Belt Co., Toronto, Ont.  
Dominion Bridge Co., Montreal, Que.

Electric Steels & Metals Ltd., Welland.  
Kennedy & Sons, Owen Sound, Ont.  
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

Northern Crane Works, Walkerville, Ont.  
Williams & Wilson, Limited, Montreal.

**HOISTS, ELEC., STATIONERY, MONO RAIL**  
Volta Mfg. Co., Welland, Ont.

**HOLDERS, STEEL DIE FOR MARKING**  
Matthews & Co., Jas. H., Pittsburgh, Pa.

**HOLDERS, ELECTRIC**  
Electric Steels & Metals, Ltd., Welland.

**HOOKS, BELT LACING**  
Clipper Belt Lacer Co., Grand Rapids.

**HOPPERS**  
MacKinnon Steel Co., Ltd., Sherbrooke.  
Dominion Bridge Co., Montreal, Que.

William Hamilton Co., Peterboro, Ont.  
Toronto Iron Works, Ltd., Toronto, Ont.

**HOSE, PNEUMATIC**  
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Garlock-Walker Machinery Co., Toronto.  
Independent Pneumatic Tool Co., Chicago.  
Wells Bros. Co. of Canada, Galt, Ont.

**HOSE, ALL KINDS**  
Int Mach. & Supply Co., Ltd., Montreal.

**HOSE, SAND BLAST**  
Pangborn Corporation, Hagerstown, Md.

**HYDRAULIC MACHINERY**  
Garlock-Walker Machinery Co., Toronto.

Metalwood Mfg. Co., Detroit, Mich.  
Niles-Bement-Pond Co., New York.  
Perrin, Ltd., William R., Toronto.  
West Tire Setter Co., Rochester, N.Y.

Victoria Foundry Co., Ottawa.  
Williams & Wilson, Limited, Montreal.

**HYDROMETERS, HYGROMETERS, HYGRODEIKS**  
Taylor Instrument Co., Rochester, N.Y.

**INDICATORS, SPEED**  
Aikenhead Hardware Co., Toronto, Ont.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Starrett Co., L. S., Athol, Mass.

**INDEX CENTRES**  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Dickow, Fred O., Chicago, Ill.  
Ford-Smith Machine Co., Hamilton, Ont.  
Garvin Machine Co., New York.

Williams & Wilson, Limited, Montreal.

**INDICATING INSTRUMENTS**  
Taylor Instrument Co., Rochester, N.Y.

**INGOT METAL**  
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

**INGOTS, STEEL**  
Nova Scotia S.I. & Coal Co., New Glasgow.

**INGOTS, FORGING AND ROLLING**  
Electric Steel & Metals Co., Welland.

**INSULATING COMPOUNDS**  
H. H. Robertson Co., Ltd., Sarnia, Ont.

**INSTRUMENTS, ENGINEERING**  
Consolidated Optical Co., Toronto.

**IRON ORE**  
Hanna & Co., M. A., Cleveland, O.

**IRON, WROUGHT, ROLLED, PIG**  
Swedish Steel & Imp't. Co., Ltd., Montreal.

**JACKS**  
Aikenhead Hardware Co., Toronto, Ont.  
Can. Fairbanks-Morse Co., Montreal.  
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

Northern Crane Works, Walkerville.  
Norton, A. O., Cootecook, Que.  
Rice Lewis & Son, Toronto, Ont.

Williams & Wilson, Limited, Montreal.

**JACKS, PIT AND TRACK**  
Canadian Fairbanks-Morse Co., Montreal.  
Northern Crane Works, Walkerville.

**JAWS, FACE PLATE**  
Quahman Chuck Co., Hartford, Conn.  
Skinner Chuck Co., New Britain, Conn.

**JOINTERS**  
Gray Ball Bearing Co., Ltd., Toronto.

**JIGS, TOOLS, ETC.**  
Brown Engineering Corp., Toronto.  
Elliott & Whitehall Mach. & Tool Co., Galt.

Gisholt Machine Co., Madison, Wis.  
Homer & Wilson, Hamilton, Ont.  
Illinois Tool Works, Chicago, Ill.  
Marten Machine Co., Hamilton, Ont.

Toronto Tool Co., Toronto, Ont.

**JOURNAL WEDGES**  
Canada Foundries & Forgings, Welland.

**KEY SEATERS**  
Garlock-Walker Machy Co., Toronto, Ont.  
Garvin Machine Co., New York.  
Morton Mfg. Co., Muskegon Heights, M.  
A. R. Williams Machy Co., Toronto.

Williams & Wilson, Ltd., Montreal.

**KEYS, MACHINE**  
Whitney Mfg. Co., Hartford, Conn.  
Williams & Co., J. H., Brooklyn, N.Y.

**KILNS**  
Can. Blower & Forge Co., Kitchener, Ont.  
Kennedy & Sons, Wm., Owen Sound, Ont.  
MacKinnon Steel Co., Sherbrooke, Que.

**KNIFE GRINDERS**  
Gray Ball Bearing Co., Ltd., Toronto.

**LABELS AND TAGS**  
Matthews & Co., Jas. H., Pittsburgh, Pa.

**LABORATORIES, INSPECTION AND TESTING (See Chemists)**

**LADLES, FOUNDRY**  
Northern Crane Works, Walkerville.

**LACING MACHINES**  
Clipper Belt Lacer Co., Grand Rapids, M.

**LAMPS, ARC, INCANDESCENT**  
Can. General Electric Co., Toronto, Ont.

**LAMPS, TUNGSTEN AND NITRO**  
Can. General Electric Co., Toronto, Ont.

**LAG SCREW GIMLET POINTERS**  
National Machy. Co., Tiffin, Ohio.

**LATH**  
H. H. Robertson, Ltd., Sarnia, Ont.

**LATHES, CHUCKING**  
Acme Machine Tool Co., Cincinnati, Ohio.  
Wood Turret Machine Co., Brazil, Ind.

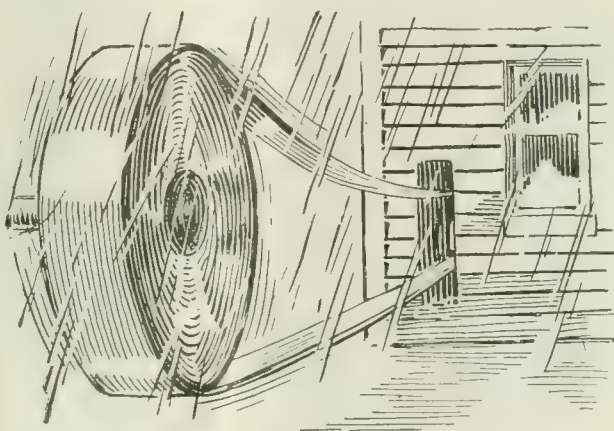
Williams & Wilson, Limited, Montreal.

**LATHE CHUCKS (See Chucks)**  
LATHE DOGS AND ATTACHMENTS  
Armstrong Bros. Tool Co., Chicago.  
Curtis & Curtis Co., Bridgeport, Conn.



# BELTING

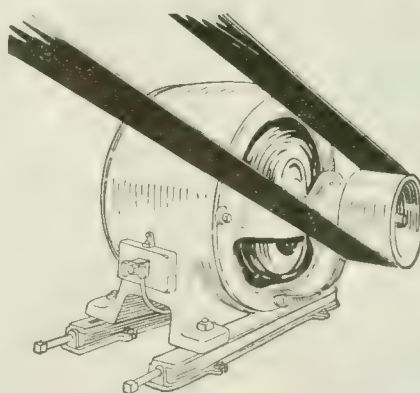
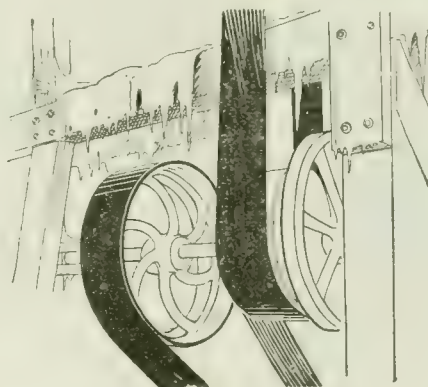
It will surely pay you to use  
**"Lanco" Balata Belting**  
 on some of your drives



IT is a real waterproof belt and not merely waterproofed. Balata gum is applied in solution and impregnates all the fibres of the duck. Every ply of this belt is waterproof. This means that if the surface is worn off or even after a ply is worn off you still have a waterproof belt. For this reason this is the belt for wet places where you require long service.

THIS belt is good for cold places and can be used under any atmospheric conditions except those of heat. For work in wet or cold places you can buy cheaper belts that will do the work as well for a time, but would you not rather have a belt that would last longer even if you had to pay more for it?

THIS belt makes an excellent motor drive belt. It is as nearly stretchless as it is possible to make a good belt and for this reason requires very little attention. We can make it endless at our own plant and this makes it even more ideal for motor service. It will pay you well to use this belt in all places covered in the above description.



**FEDERAL ENGINEERING CO., LIMITED**  
 172 John St., Toronto



Hendley Machine Co., Torrington, Conn.  
Williams & Co., J. H. Rossmore, N.Y.

**LATHES, AUTOMATIC AND SEMI-AUTOMATIC**

Gisholt Machine Co., Madison, Wis.  
Wood Turret Machine Co., Brant, Ind.

**LATHES, AXLE**

Bridgford Mach. Tool Works, Rochester.

**LATHES, BORING**

Bridgford Mach. Tool Works, Rochester.  
Lodge & Shipley, Cincinnati, O.

**LATHES, PRECISION, BENCH**

W. F. & John Barnes, Co., Rockford, Ill.  
J. G. Blount & Co., Everett, Mass.  
Canadian Fairbanks-Morse Co., Montreal.  
Geo. F. Foss Machy. & Supply Co., Montreal.

Garlock-Walker Machinery Co., Toronto.  
Harding Bros., Chicago, Ill.

Pratt & Whitney Co., Dundas, Ont.  
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

Williams & Wilson, Ltd., Montreal, Que.

**LATHES, BRASS**

Acme Machine Tool Co., Cincinnati, Ohio.  
Harding Bros., Chicago, Ill.

Pratt & Whitney Co., Dundas, Ont.  
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

Williams & Wilson, Ltd., Montreal, Que.

**LATHES, ENGINE**

Acme Machine Tool Co., Cincinnati, Ohio.  
John Rossmore & Sons Co., Dundas, Ont.

Bridgford Mach. Tool Works, Rochester.  
Canadian Machy. Co., Galt, Ont.

Canadian Fairbanks-Morse Co., Montreal.  
Cleo Machine Tool Co., Cincinnati, Ohio.

Wicks Bros., Saginaw, Mich.  
G. F. Foss Machy. & Supply Co., Montreal.

Garlock-Walker Machinery Co., Toronto.  
Gisholt Machine Co., Madison, Wis.

Kennedy & Sons, Wm., Owen Sound, Ont.  
R. McKeagill Co., Galt.

Miles-Bement-Pond Co., New York.  
Roe Valve Tool Co., Hamilton.

Smalley-General Co., Inc., Bay City, Mich.  
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

Sidney Tool Co., Sidney, Ohio.  
Walcott Lathe Co., Jackson, Mich.

Whitcomb-Bassell Mach. Tool Co., Worcester, Mass.

A. R. Williams Machy. Co., Toronto.  
Williams & Wilson, Ltd., Montreal, Que.

Worcester Lathe Co., Worcester, Mass.

**LATHES, FOOT POWER**

Seneca Falls Mfg. Co., Seneca Falls, N.Y.

**LATHES, HORIZONTAL**

Wood Turret Machine Co., Brant, Ind.

**LATHES JOURNAL TRUEING**

Bridgford Mach. Tool Works, Rochester.

**LATHE MANDRELS, HARDENED AND GROUND**

Ellis & Whitcomb, Galt, Ont.

**LATHES, PATTERNMAKERS'**

J. G. Blount Co., Everett, Mass.  
Can. Machinery Corp., Galt.

Wood Turret Machine Co., Brant, Ind.  
G. F. Foss Machy. & Supply Co., Montreal.

Garlock-Walker Machy. Co., Toronto, Ont.  
Williams & Wilson, Ltd., Montreal, Que.

**LATHES, POLISHING**

Greenfield Tap & Die Corp., Greenfield.

Wells Bros. of Canada, Galt, Ont.  
Williams & Wilson, Ltd., Montreal, Que.

**LATHES, SCREW CUTTING**

Bertram & Sons Co., John, Dundas, Ont.

Bridgford Mach. Tool Works, Rochester.  
Canada Machinery Corp., Galt, Ont.

Cleo Machine Tool Co., Cincinnati, O.  
Foss Machy. & Supply Co., G. F., Montreal.

Garlock-Walker Machy. Co., Toronto, Ont.  
Harding Bros., Inc., Chicago, Ill.

Harbison Ltd., John T., Toronto, Ont.  
Niles-Bement-Pond Co., New York.

Roe Valve Tool Co., Hamilton.  
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

Whitcomb-Bassell Mach. Tool Co., Worcester, Mass.

Wicks Bros., Saginaw, Mich.  
Williams Machy. Co., A. R., Toronto.

Wood Turret Machine Co., Brant, Ind.  
Worcester Lathe Co., Worcester, Mass.

Williams & Wilson, Ltd., Montreal, Que.

**LATHES, SPINNING**

Riley Co., E. W., Brooklyn, N.Y.

Williams & Wilson, Ltd., Montreal, Que.

**LATHES, TOOL ROOM**

Cleo Machine & Tool Co., Cincinnati, O.

Harding Bros., Inc., Chicago, Ill.  
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

Worcester Lathe Co., Worcester, Mass.  
Williams & Wilson, Ltd., Montreal, Que.

**LEAD BURNING**

St. Lawrence Welding Co., Montreal

**LEAD BURNING OUTFITS**

Turner Hase Works, Sycamore, Ill.

**LEATHER STRAPPING**

Graton & Knight Mfg. Co., Worcester, Mass.

**LENSES FOR GOGGLES**

Standard Optical Co., Geneva, N.Y.

**LETTERS AND FIGURES, METAL**

Hendley & Phipps Mfg. Co., N. H., Conn.

**LIDS, SCREW TOP AND HINGE**

Can. Winkley Co., Ltd., Windsor, Ont.

**LINK BELTING**

See Belting, Chain.

**LINOLEUM MILL MACHINERY**

Bentham, Ltd., Edinburgh, Scotland.

**LOCKERS, STEEL WARDROBE AND STEEL MATERIAL**

Canada Wire & Iron Gals. Co., Hamilton  
Dennis Wire & Iron Works, London, Ont.

**LUBRICANTS**

Cataract Refining & Mfg. Co., Toronto.

**LUBRICANTS, CUTTING AND GRINDING, DRAWING, STAMPING**

Union Lubricating Co., New York, N.Y.

**LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS**

Brown Co., Ltd., S. F., Toronto, Ont.

**LUBRICATORS**

Traction Pump Co., Rockford, Ill.

**LUMBERMEN'S TOOLS**

Thos. Pink Co., Ltd., Pembroke, Ont.

**MACHINE COUNTER WEIGHTS**

Katie Foundry, Galt, Ont.

**MACHINE TOOLS**

Roe Valve Tool Co., Hamilton.

**MACHINERY, CORNER AND BENDING**

Peck, Stow & Wilcox, Scarborough, Conn.

**MACHINERY DEALERS**

Archibald & Co., Chas. P., Montreal.  
Can. Fairbanks-Morse Co., Montreal.

Ellis & Whitcomb, Galt, Ont.  
Foss Machy. & Supply Co., G. F., Montreal.

Garlock-Walker Machy. Co., Toronto, Ont.  
Williams Machy. Co., A. R., Toronto.

Williams & Wilson, Ltd., Montreal, Que.

**MACHINERY GUARDS (See Guards)****MACHINERY, SPECIAL**

Hogson & Pettis Mfg. Co., New Haven, Conn.

**MACHINISTS' TOOLS**

Brown & Sharpe Mfg. Co., Providence, R.I.

**MAGNETIC BRAKES FOR ELECTRIC MOTORS**

Volta Mfg. Co., Welland, Ont.

**MANDRELS**

Ellis & Whitcomb, Galt, Ont.  
Can. Fairbanks-Morse Co., Montreal.

Cleveland Twist Drill Co., Cleveland.  
Jardine & Co., A. B., Hespeler, Ont.

Morse Twist Drill & Mach. Co., New Bedford, Mass.

Pratt & Whitney Co., Dundas, Ont.

**MARKING DEVICES**

Pritchard-Andrews Co. of Can., Ottawa.

Matthews & Co., Jas. H., Pittsburgh, Pa.

**MARKING MACHINERY**

Brown, Rogers Co., Hamilton, Ont.

Foss Machy. & Supply Co., G. F., Montreal.  
Perrin, Wm. R., Toronto.

Williams & Wilson, Ltd., Montreal, Que.

**MASKS, WELDING, SMOKE, FUME, GAS, ETC.**

Strong, Kennard & Nutt Co., Cleveland.

**MEASURING MACHINES**

Pratt & Whitney Co., Dundas, Ont.

**MEASURES, REGISTERING**

Brown Co., Ltd., S. F., Toronto, Ont.

**MEASURING TAPES AND RULES**

Chesterman & Co., Jas., Sheffield, Eng.

**METALLURGISTS**

See Chemists.

**METAL CLEANERS**

Oakley Chemical Co., New York, N.Y.

**METAL SAWS**

See Saws.

**METAL SAWS, POWER**

Hoefler Mfg. Co., Freeport, Ill.

**METALS**

Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

Canada Metal Co., Toronto, Ont.  
Rice Lewis & Son, Toronto, Ont.

Standard Machy. & Supplies, Montreal.

**METAL, STAMPINGS, SMALL**

Can. Winkley Co., Ltd., Windsor, Ont.

**METERS, OIL, GASOLINE, KEROSENE, ETC.**

Powder Co., Ltd., S. F., Toronto, Ont.

**MICROMETERS**

Almond Mfg. Co., Ashburnham, Mass.

Taylor, J. A. M., 318 Stair Bldg., Toronto.

Williams & Wilson, Ltd., Montreal, Que.

**MILLS, BRACE AND TUBE**

Elec. Steel & Metals, Welland, Ont.

**MILLS, SAND**

Frost Mfg. Co., Chicago, Ill.

**MILL MACHINERY**

Alexander Fleck, Ltd., Ottawa.

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Harding Bros., Inc., Chicago, Ill.

Hendley Mach. Co., Torrington, Conn.

Hinckley Machine Works, Hinckley, Wis.

Kearney & Trecker Co., Milwaukee, Wis.

Kemp-Smith Mfg. Co., Milwaukee, Wis.

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Cleveland Milling Machine Co., Cleveland.

Kearney & Trecker Co., Milwaukee, Wis.

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Cleveland Milling Machine Co., Cleveland.

Cincinnati Milling Machine Co., Cincinnati.

Ford-Smith Mach. Co., Hamilton, Ont.

Foss Machy. & Supply Co., G. F., Montreal.

Garlock-Walker Machy. Co., Toronto, Ont.

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Harding Bros., Inc., Chicago, Ill.

Hendley Machine Co., Torrington, Conn.

Kearney & Trecker Co., Milwaukee, Wis.

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Bilton Mach. Tool Co., Bridgeport, Conn.

Brown & Sharpe Mfg. Co., Providence.

Canada Machinery Corp., Galt, Ont.

Cleveland Milling Machine Co., Cleveland.

Cincinnati Milling Machine Co., Cincinnati.

Ford-Smith Mach. Co., Hamilton, Ont.

Foss Machy. & Supply Co., G. F., Montreal.

Garlock-Walker Machy. Co., Toronto, Ont.

Gooley & Edmund, Inc., Cortland, N.Y.

Harding Bros., Inc., Chicago, Ill.

Hendley Machine Co., Torrington, Conn.

Kearney & Trecker Co., Milwaukee, Wis.

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Planing Mill Fan



No. 2 Vacuum Cleaner

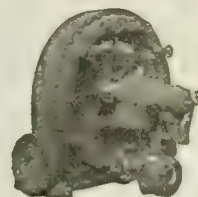
# Sturtevant

(TRADE MARK)

## SYSTEMS



Autoforce Ventilator



Steam Turbine



Electric Propeller Fan

# Sturtevant

(TRADE MARK)

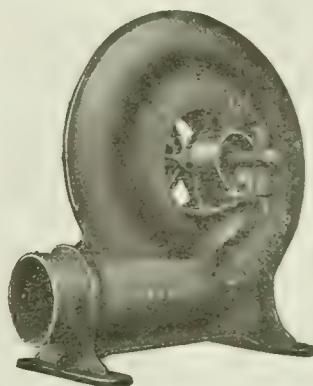
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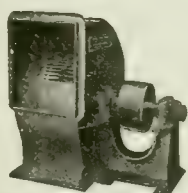
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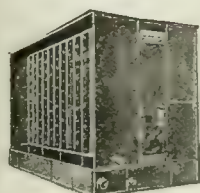
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Type H Air Washer



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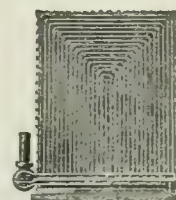
# Sturtevant

(TRADE MARK)

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VS-7 Steam Engine



Heater

*If interested tear out this page and place with letters to be answered.*



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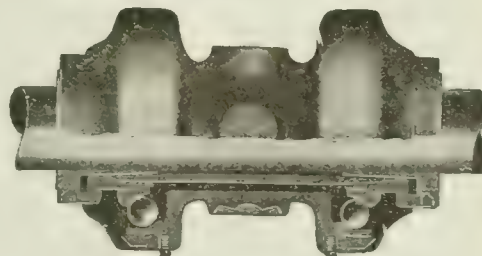
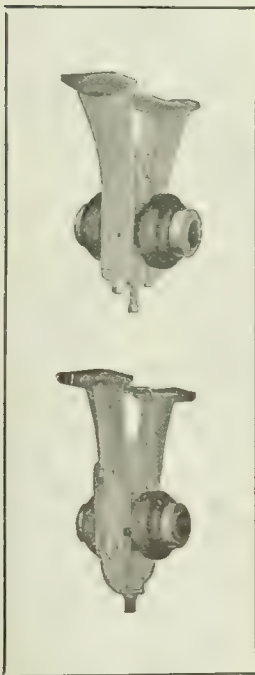
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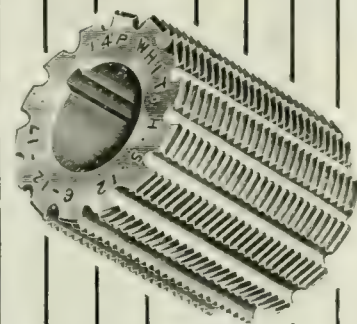
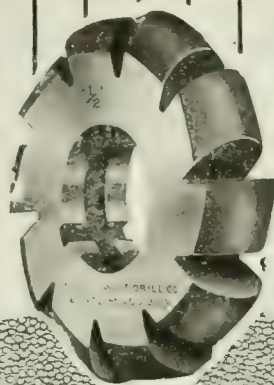
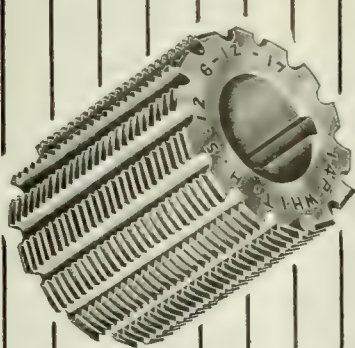
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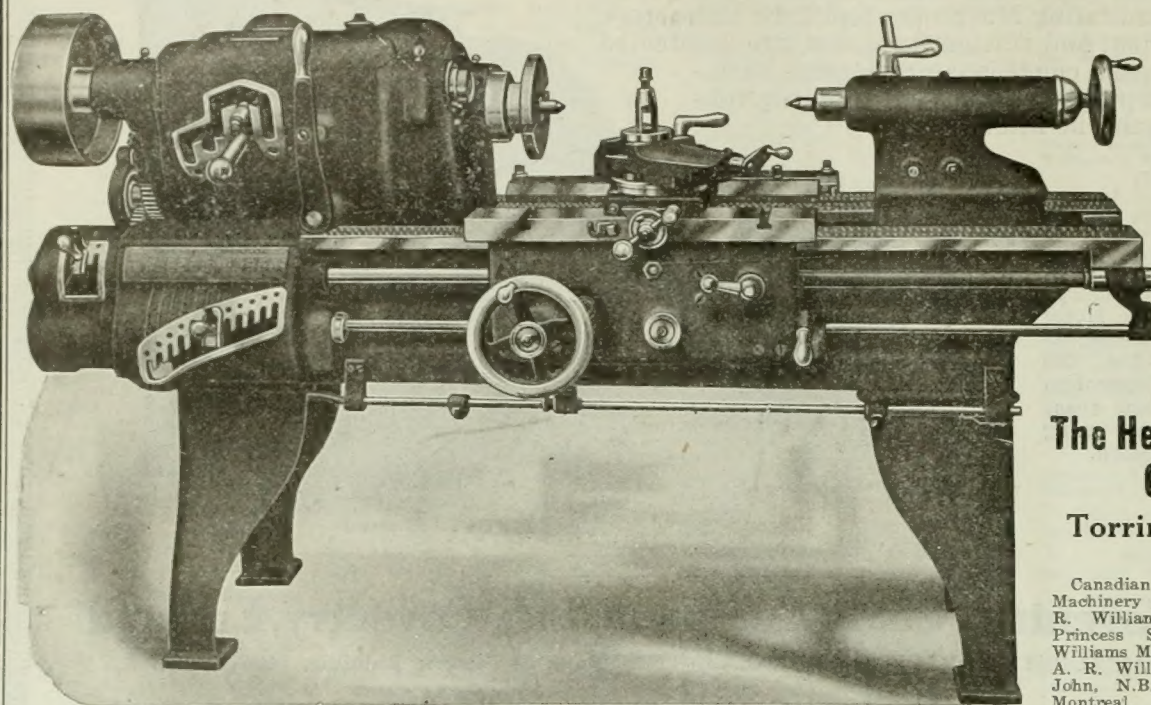
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Can. Ingersoll-Rand Co.	6	Hull Iron & Steel Foundries	78	Norton Co.	28	Universal Grinding Machine Co.	71
Can. Link-Belt Co.	15	Hungerford Brass & Copper, U.	66	Nova Scotia Steel & Coal Co.	11	<b>V</b>	
Can. Sanier Mfg. Co.	14	<b>I</b>		<b>O</b>		Victor Tool Co.	84
Can. Steel Foundries	9	Illingworth Steel Co., John	13	Oliver Machinery Co.	91	Victoria Foundry Co.	74
Carlyle Johnson Mach. Co.	8	Independent Pneumatic Tool Co.	83	<b>P</b>		Victory Loan	74
Catamarat Refining Co.	89	Ingersoll File Co.	28	Page Steel & Wire Co.	93	<b>W</b>	
Chapman Double Ball Bearing Co.	65, 107	International Machinery & Supplies	70	Pangborn Corporation	93	Welding & Supplies, Ltd.	71
Classified Advertising	68	<b>J</b>		Parmenter, Bulloch Co.	92	Wheel Tracing Tool Co.	91
Cleveland Wire Spring Co.	67	Jacobs Mfg. Co.	18	Peerless Machine Co.	26	West Tire Setter Co.	27
Consolidated Optical Co.	93	Jarline & Co., A. B.	13	Pilot Steel & Tool Co.	14	Whitton Mach. Co., D. E.	70
Covenstry Chain Co.	111	Johnson Machine Co., Carlyle	8	Plewes, Ltd.	66	Wilkinson & Kompass	70
Cushman Chuck Co.	84	Joyce-Koebel Co.	73	Positive Clutch & Pulley Works	92	Williams Tool Co.	27
<b>D</b>		<b>K</b>		Pratt & Whitney...Inside front cover	76	Williams & Co., J. H.	89
Darling Bros., Limited	99	<b>L</b>		Prest-O-Lite Co.	76	Willson & Co., T. A.	93
Davidson Mfg. Co., Thos.	59	<b>M</b>		Puro Sanitary Drink'g Fountain Co.	66	Wilson & Co., J. C.	16
Davis-Bourneville Co.	92	<b>N</b>		<b>Z</b>		Wilt Twist Drill Co.	7
Dominion Foundries & Steel, Ltd.	101	<b>O</b>		<b>Z</b>		Wood Turret Machine Co.	71
Dominion Belting Co., Ltd.	67	<b>P</b>		<b>Z</b>		Zenith Coal & Steel Products	68
Dominion Bridge Co.	87	<b>Q</b>		<b>Z</b>			
Dunbar Bros. Co., The	76	<b>R</b>		<b>Z</b>			



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# RE-BUILT MACHINE TOOLS

We offer, subject to prior sale, the following Machine Tools, which have been thoroughly overhauled and rebuilt in our own shop and are all in good working condition:

## LATHES

- 1—3 x 36 Jones & Lamson Turret Lathe.
- 1—20 x 8 Boye & Emmes Lathe, Quick Change Gear, Double Back Gear, complete with Chuck, Taper Attachment, and regular equipment.
- 2—20 x 8 Boye & Emmes Lathes, Quick Change Gear, Double Back Gear, complete with Chuck and regular equipment.
- 1—Carroll Jamieson Lathe, 16 x 10, Quick Change Gear, Double Back Gear, complete with regular equipment and taper attachment.
- 1—Carroll Jamieson Lathe, 16 x 8, Quick Change Gear, Double Back Gear, complete with regular equipment.
- 2—18 x 8 Mueller Lathes, Quick Change Gear, Double Back Gear, with regular equipment.
- 2—16 x 8 Pratt & Whitney Turret Lathes.
- 1—16 x 6 Lathe, complete with Chuck and regular equipment.
- 1—14 x 6 Monarch Lathe, with regular equipment.
- 1—16 x 6 Flather Lathe.
- 2—16 x 6 McDougall Semi-Quick Change Gear Lathes, with Chuck and regular equipment.
- 1—24 x 16 Lodge & Shipley Lathe, Quick Change Gear, Double Back Gear, with regular equipment.
- 1—Lodge, Davis & Co. Lathe, 16 x 10, plain type.
- 1—20 x 36 x 12-foot Gap Lathe, with Chuck.
- 1—14 x 6 Gardner Lathe, with Chuck and regular equipment.
- 2—14 x 6 Sebastian Lathes, with Chucks and regular equipment.
- 1—16 x 8 Gardner Lathe, with Chuck and regular equipment.
- 1—26 x 40 x 12-foot Bertram Gap Lathe, with Chuck and regular equipment.
- 2—20 x 8 All Geared Head American Lathes, with Chuck and regular equipment.

## HACK SAW MACHINES.

- 17—No. 1 Racine Hack Saw Machines.
- 1—Rapid Cut Hack Saw Machine, 8" capacity.

## DRILL PRESSES.

- 1—20" Buffalo Back Geared Drill Press.
- 1—24" Snyder Sliding Head Drill Press.
- 1—Mechanics Machine Co. 24" Sliding Head Drill Press.
- 1—36" Sibley Sliding Head Drill Press.
- 1—22" Sibley Sliding Head Drill Press.
- 1—16" Sipp Tool Room Drill  $\frac{7}{8}$  capacity.
- 1—W. B. Knight Universal Tool Room Drill.
- 1—20" Back Geared Excelsior Drill Press.

## GRINDERS.

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- 1—No. 2 Brown & Sharpe Surface Grinder with magnetic chuck.
- 1—Stevens Cutter Grinder.
- 2—Gardner Surface Grinders.

## MILLING MACHINES.

- 2—No. 21 Garvin Milling Machines.
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- 1—30 x 30 x 8' Bertram Planer.
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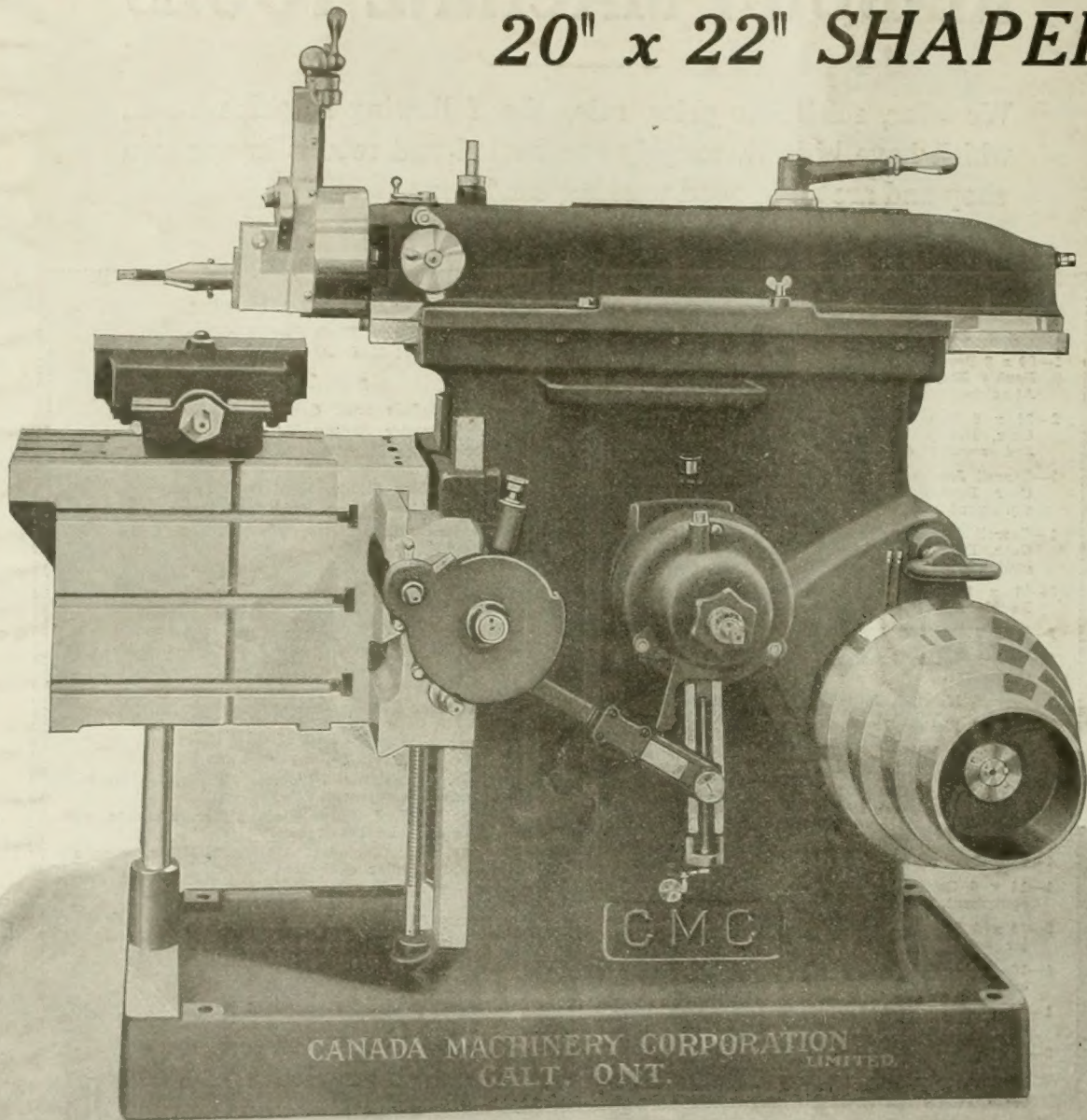
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## 20" x 22" SHAPER



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